An assessment of the relevance of Environmental Management Accounting for sustainability in Zimbabwe's extractive industries

by
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DECLARATION

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(Cuthbert Muza)

ABSTRACT

Environmental Management Accounting (EMA) has taken centre stage in companies with high environmental impacts, as literature reveals. The aim of this study was to assess current and potential relevance of Environmental Management Accounting in Zimbabwe's mining sector and extractive industries. In assessing the relevance of EMA in the mining sector, the research was guided by research questions aimed at understanding whether EMA actually or potentially contributes to the sustainability of the mining sector and whether EMA systems contribute positively towards sustainability better than traditional accounting systems. The research premise was that, given the limited information about the implementation and relevance of EMA in Zimbabwe's mining sector and extractive industries, EMA is an area of study which justifies in-depth research. It was further premised that implementation of EMA enhances sustainability in extractive industry and mining development.

To achieve the aim of this study, a qualitative research design was adopted with an interpretivist paradigm. The researcher used multiple methods of data collection to source both primary and secondary data. These methods included open-ended questionnaires, interviews and document analysis. This helped to validate the results generated by triangulating them for purposes of consistency, confirmability and to reduce research bias. The researcher used the snowball sampling method to reach 34 companies out of a possible 89 companies. The study was a case study of the mining sector with the unit of analysis being the single companies in the sector. The multiple embedded cases of individual companies were analysed using 'Atlas.ti' qualitative data analysis software.

The research findings indicate that EMA contributes positively in the mining sector, thereby promoting sustainability. However, the use of EMA is at entry level with random application. There are strong indicators of Environmental Management Accounting practices in the company's traditional accounting systems. The different perspectives on EMA support the idea that the mining sector is complex; hence the implementation of EMA is difficult. The cost of implementing EMA does not outweigh the benefits thereof. The results also indicate that EMA improves the running of mining companies on a day-to-day basis. In spite of these encouraging findings, the benefits of EMA have not yet been fully realised in Zimbabwe because they can only be visible once EMA is being implemented more systemically. Notwithstanding, EMA has the potential to promote sustainability through the three pillars of sustainable development. The study revealed that, although the traditional accounting system addresses the three pillars of sustainability, it was not clear how the social pillar was being addressed. There are many benefits to be gained through EMA, with commensurate

challenges of implementing it. Among the challenges is the need for stakeholders and management buy-ins in EMA applications. Research findings indicate that the paucity of EMA literature is limited to developing countries and emerging markets. While EMA is contributing positively in the Zimbabwean mining sector and extractive industries, companies are reluctant to implement it because of an envisaged capital intensive nature and lack of knowledge.

The researcher recommends that companies be made aware of material flow cost accounting using physical environmental management accounting (PEMA) and monetary environmental management accounting (MEMA) systems. There is need to prioritise the development of sector-specific EMA standards. The accounting profession should also embrace developments in sustainability accounting and further develop their standards on guiding accounting professionals in how to implement a full-fledged EMA. The accounting profession should also work with other professionals to effectively implement EMA. The researcher recommends that further research be conducted to determine the role of legislation in Environmental Management Accounting. It will also be ideal to conduct research to check the impact of EMA on social issues.

OPSOMMING

Soos in die literatuur aangedui, het omgewingsbestuursrekeningkunde het die belangrikste posisie in maatskappye met hoë omgewingsimpakte ingeneem. Die doel van hierdie studie was om die huidige en potensiële toepaslikheid van omgewingsbestuursrekeningkunde in Zimbabwe se mynbou- en ontginningsbedrywe te evalueer. By die beoordeling van die toepaslikheid van omgewings-bestuursrekeningkunde in die mynbousektor, is die navorsing gelei deur navorsingsvrae wat daarop gemik was om te verstaan of omgewingsbestuursrekeningkunde werklik of potensieel tot die volhoubaarheid van die mynbousektor bydra en of omgewingsbestuursrekeningkunde-stelsels beter as tradisionele rekeningkundige stelsels positief tot volhoubaarheid bydra. Gegewe die beperkte inligting oor die implementering en toepaslikheid van omgewingsbestuursrekeningkunde in Zimbabwe se mynbou- en ontginningsbedrywe, was die navorsingsveronderstelling dat omgewingsbestuursrekeningkunde 'n studiegebied is wat deeglike navorsing regverdig. Verder is veronderstel dat die implementering van omgewingsbestuursrekeningkunde volhoubaarheid in die ontginningsbedryf en mynbou-ontwikkeling verbeter.

'n Kwalitatiewe navorsingsontwerp met 'n interpretivistiese paradigma is gebruik om die doel van hierdie studie te bereik. Verskeie metodes is vir data-insameling gebruik om primêre sowel as sekondêre data te verkry. Hierdie metodes het oop vraelyste, onderhoude en dokument-analise ingesluit. Dit het bygedra om die resultate wat gegenereer is deur triangulering vir konsekwentheid en bevestigbaarheid te bevestig, en navorsingsvooroordeel te verminder. Die navorser het die sneeubalmetode vir die steekproef gebruik om 34 uit 'n moontlike 89 maatskappye te betrek. Die studie het 'n gevallestudie van die mynbousektor behels, met die enkele maatskappye in die sektor as ontledingseenheid. Die meervoudige ingebedde gevalle van individuele maatskappye is met behulp van 'Atlas.ti' kwalitatiewe data-analisesagteware ontleed.

Die navorsingsbevindings dui daarop dat omgewingsbestuursrekeningkunde 'n positiewe bydrae in die mynbousektor lewer en volhoubaarheid daardeur bevorder. Die gebruik van omgewings-bestuursrekeningkunde vind egter op toetreevlak met ewekansige toepassing plaas. Die maatskappy se tradisionele rekeningkundige stelsels toon sterk aanwysers van omgewingsbestuurs-rekeningkundige praktyke. Die verskillende perspektiewe op omgewingsbestuursrekeningkunde ondersteun die idee dat die mynbousektor kompleks is; die implementering daarvan is dus moeilik, maar koste verbonde aan die implementering van omgewingsbestuursrekeningkunde oortref nie die voordele daarvan nie. Die resultate dui ook daarop dat omgewingsbestuursrekeningkunde die bedryf van mynmaatskappye op 'n daaglikse basis verbeter. Ten spyte van hierdie bemoedigende bevindinge, word die voordele van omgewingsbestuursrekeningkunde nog nie ten volle in Zimbabwe gerealiseer

nie, omdat dit eers sigbaar word wanneer omgewingsbestuursrekeningkunde meer stelselmatig geïmplementeer word. Omgewingsbestuursrekeningkunde het nieteenstaande die potensiaal om volhoubaarheid deur die drie pilare van volhoubare ontwikkeling te bevorder. Hoewel die tradisionele rekeningkundige stelsel die drie pilare van volhoubaarheid aanspreek, het die studie egter getoon dat hóé die maatskaplike pilaar aangespreek word, nie duidelik is nie. Baie voordele kan deur omgewingsbestuursrekeningkunde verkry word, met ooreenstemmende uitdagings om dit te implementeer. Onder die uitdagings is die behoefte aan belanghebbendes en bestuursinkope in die aanwending van omgewingsbestuursrekeningkunde. Die navorsingsbevindings toon die gebrek aan literatuur oor omgewingsbestuursrekeningkunde as beperk tot ontwikkelende lande en ontluikende markte. Terwyl omgewingsbestuursrekeningkunde positief tot die Zimbabwiese mynbou- en ontginningsbedrywe bydra, is maatskappye huiwerig om dit vanweë die veronderstelde kapitaalintensiewe aard daarvan en gebrek aan kennis te implementeer.

Die navorser beveel aan dat maatskappye met gebruik van fisiese omgewingsbestuurs-rekeningkunde en monetêre omgewingsbestuursrekeningkundestelsels van wesenlike vloeikosterekeningkunde bewus gemaak word. Dit is nodig om prioriteit aan die ontwikkeling van sektorspesifieke omgewingsbestuursrekeningkundestandaarde toe te ken. Die rekeningkundige professie moet ook ontwikkelings in volhoubaarheidsrekeningkunde aanvaar en hul standaarde t.o.v. leiding aan professionele rekenkundiges oor hoe om volwaardige omgewings-bestuursrekeningkunde te implementeer, verder ontwikkel. Dit sal ook ideaal wees om navorsing oor volhoubaarheidsrekeningkunde se impak op sosiale kwessies te onderneem.

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I dedicate this work to my mother, Mrs. Frasia Muza nee Kwangwari (*Mamoyo*), and my father Mr. Robert Muza (*Mdara Mandebvu*), who indirectly made me what I am today. I am sure you are proud. I also dedicate this work to my wife and our children, Anesuishe, Anotida, Atida and Adiwa. Special dedication to my brother Aloys Robson Madakasi. Cap *iyi ndeyenyu Zhou! Makakumbira one ndakupai mbiri.*

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS

COMZ	Chamber of Mines of Zimbabwe
CSR	Corporate Social Responsibility
EMA	Environmental Management Accounting
EMAAN	Environmental Management Accounting African Network
EMA(Z)	Environmental Management Agency of Zimbabwe
ESG	Environmental Social and Governance
GDP	Gross Domestic Product
GRI	Global Reporting Initiatives
GHG	Greenhouse gas emission
FA	Financial Accounting
IAS	International Accounting Standards
IASB	International Accounting Standards Board
IFAC	International Federation of Accountants
IFRIC	International Financial Reporting Interpretations Committee
IFRS	International Financial Reporting Standards
IIRC	International Integrated Reporting Council
IR	Integrated Reporting
JEPA	Japan Environmental Protection Agency
MEMA	Monetary Environmental Management Accounting
MMCZ	Minerals Marketing Corporation of Zimbabwe
PEMA	Physical Environmental Management Accounting
SA	Sustainability Accounting
SAF	Sustainability Accounting Framework
SCC	Sustainable Cost Calculation
SD	Sustainable Development
SDG	Sustainable Development Goals

SEA	Social Environmental Accounting
SMEs	Small and Medium-sized Enterprises
TBL	Triple Bottom Line
UN	United Nations
UNDP	United Nations Development Programme
UNDSD	United Nations Department for Sustainable Development
UNEP	United Nations Environmental Protection
UNSDG	United Nations Sustainable Development Goals
USEP	United States Environmental Protection Agency
USGS	United States Geological Survey
ZIMSTATS	Zimbabwe National Statistics Agency
ZMDC	Zimbabwe Minerals Development Corporation

CHAPTER 1
INTRODUCTION

1.0. Introduction

Environmental issues are taking a centre stage in the world. With issues relating to climate change and green revolution, there is pressure on industries/organisations to reduce the negative impacts on the environment. The mining sector and extractive industries is among the largest contributors to environmental degradation, (Goldenberg, 2013; Heede, 2014) contributing over 30 percent to the world environmental pollution mainly in the form of carbon emission and greenhouse gas (GHG) emissions. Most of the companies have environmental mitigation measures in place but lack the systems to account for the costs and benefits in physical and monetary terms (Cortese, Irvine & Kaidonis, 2009). Environmental Management Accounting (EMA) has proved to be one way of accounting for the costs and benefits of positive or negative environmental impacts.

Environmental Management Accounting (EMA) is a concept that has reached adulthood in theory and many sectors in developed countries since the time it was introduced around the 1990s (Qian & Burritt 2009 as cited in Christ & Burritt, 2012; Dumay, Bernardi, Guthrie & Demartini, 2016). Environmental Management Accounting came because of the shortcomings of conventional management accounting and financial accounting to address environmental issues separately in industries with high environmental impacts (Christ & Burritt, 2012; Jamil *et al.*, 2015). These industries include the mining sector and extractive industries but these sectors, according to literature (Cortese, Irvine & Kaidonis, 2009; IFAC, 2005;United Nations, 2001b;) , have not been adequately investigated to check the modalities of how EMA is being implemented to encourage environmental efficiency. The mining sector and extractive industries are on record as having high environmental impacts with irreparable damages (Alewine, 2010; Garvin *et al.*, 2009; Murombo, 2013). Although, it has been perceived that because most environmental impacts are negative and implementation of EMA could therefore be detrimental to the financial viability of companies, there are benefits which can be harvested through the implementation of EMA in different companies. While the sector is on record for having the highest negative environmental impacts (Murombo, 2013), there is limited accounting efforts to demonstrate how they are mitigating them through the implementation of EMA. This calls for the need of empirical study on the effectiveness of EMA.

Literature is awash with evidence of the benefits that accrue to companies after the implementation of EMA. Fujitsu Group and Canon Group (both in Japan), Marauer Bier Breweries in Austria and Xerox's European Photocopiers are some of the companies that are benefiting from the implementation of EMA systems in their operations (IFAC, 2005).

This study assesses the existing and potential impact of Environmental Management Accounting (EMA) in Zimbabwe, specifically in the mining sector and extractive industries, to promote sustainable development practices. The study adopted the United Nations (2001b) definition which states: "Environmental Management Accounting serves as a mechanism to identify and measure the full spectrum of environmental costs of current production processes and the economic benefits of pollution prevention or cleaner processes and to integrate these costs and benefits into day-to-day business decision-making". United Nations recognises EMA not only as a control mechanism but also as a profit recognition and measurement system, thus incorporating the term "benefits'' in the definition. The definition also considers two of the three pillars of sustainable development; namely, economic viability and environmental responsibility. EMA by its nature points to sustainable development because of these two pillars.

There is a need to establish the significance of EMA in the mining sector and extractive industries and to examine how Environmental Management Accounting can be implemented in order to finally develop a model framework for EMA. Hence, many countries in the world are contributing positively towards the expert working group on improving the government's role in the promotion of Environmental Management Accounting established by the United Nations Commission on Sustainable Development in which Zimbabwe is a participant (United Nations, 2001b). The major aim of this commission is to achieve sustainability in the industry and commerce all over the world. It is expected that, as a member of this working group, the government of Zimbabwe should facilitate, regulate and enforce the implementation of EMA initiatives in different sectors of the economy. For example, the Japan Ministry of Environment developed environmental accounting guidelines and oversees the implementation of EMA in the country (IFAC, 2005). Similar guidelines are not available in Zimbabwe's mining sector. To the researcher's knowledge, there are no significant strides being made regarding EMA in Zimbabwe's mining sector.

The purpose of this study was, therefore, to assess the current and potential relevance of environmental management accounting for sustainability in Zimbabwe's extractive industries focusing on how the government of Zimbabwe currently regulates the mining industry - including reporting requirements; explore how EMA promotes sustainability in the mining sector and extractive industries better than traditional accounting; and to fully assess the worth of Environmental Management Accounting in promoting sustainability.

1.1. Background to the Study

The way in which the environment is viewed has changed over time from protecting humans from the environment to protecting the environment from humans and now perhaps trying to protect us

from ourselves and achieve more subtle balanced benefits (Gemmell & Scott, 2013). The change in environment perspective over time given by Gemmell and Scott (2013) above shows the evolution of environmental management and underscores the importance of Environmental Management Accounting. This is acknowledged by the International Federation of Accounting, which submits that taking care of the environment has become an enormous global preoccupation, and that accounting for the environment and related issues is increasingly gaining importance (Christ & Burritt, 2012; IFAC, 2005).

Globally, many organisations are moving towards the 'green revolution' which consist of green accounting, green environment, green markets, green research and green purchasing. Organisations in Zimbabwe, both in the public and private sectors, are not exempted from the green revolution as evidenced through their corporate governance initiatives. For instance, Econet, which is Zimbabwe's largest mobile network, and Telecel provide solar products, 'green' outlets and green network boost stations (Kabweza, 2011).

According to environmental pressure groups, the extraction of mineral resources such as coal, diamonds, gold, natural gas and other minerals can have an extreme and a detrimental impact on the environment (Qian, Burritt & Chen, 2015; Qian, Burritt & Monroe, 2011). The impacts include pollution of the environment during extraction operations, erosion and outright removal of topsoil and vegetation; sedimentation of nearby water bodies; disruption of wildlife feeding and reproduction and migration habitat (IFAC, 2011). There are also negative effects on the livelihood of people who depend on the affected ecosystem for food and clean water. The depletion of non-renewable or slowly renewable natural resources is also a cause for concern (IFAC, 2005). Extractive industries, as indicated by IFAC (2005) lack environmental sustainability as they deplete non-renewable natural resources which can never be placed back.

In Zimbabwe, mining has become the most dynamic sector of the economy since 2009, leading the recovery, with an average annualised growth of more than 30 percent. Mineral exports rose by 23 percent over the 2009-2011 periods, making mining the leading export sector (Government of Zimbabwe: Ministry of Finance and Economic Development, 2015). Besides the growth prospect being forecasted in the mining sector, Fraser Institute (2014) describe Zimbabwe as among the worst jurisdictions for mining investments. This is hinged on the fact that the Mines and Minerals Act [Chapter 21:05], No. 1 of 1961 (1961) which regulates the mining sector is 'old and archaic' (Mtisi, Dhliwayo & Makore, 2014:5). The mining sector needs checks and balances to ensure that everything that is appropriate for full growth of the industry supported by heavy mining investments is in place. This brings about the issues of Environmental Management Accounting.

Environmental Management Accounting is critical in Zimbabwe's extractive industries and mining sector considering the phenomenal growth witnessed in the industry over the past years. The growth needs to be buttressed by appropriate EMA systems to ensure that companies and the society benefit through utilising the available tools. Case studies all over the world where EMA is being implemented have proven that the benefits of an EMA system outweigh the cost of the lack thereof (Ambe, 2007). In 2000, Ricoh estimated its expenditures on environmental management activities at US$66 million, with resulting benefits of US$79 million to the company (Ambe, 2007; Hibbitt & Collison, 2004; IFAC, 2005; RICOH, 2000). The literature reviewed shows that the benefits of EMA are much less than the costs (IFAC, 2005) in the short run, but in the long run this notion turns out to be false. The investment in EMA usually requires large initial capital and knowledge investment while the results are spread over a long period of time.

Recently Zimbabwe African Chrome Fields (ACF) Company, which is owned by Moti holdings, a non-listed South African Company, introduced a new technology of smelting chrome called the exothermic process (Mhlanga 2015). This process allows the ore to produce its own heat and smelt chrome separating it from slag in less than seven minutes and ready for the market. The process normally takes six hours in conventional furnaces using high voltage electricity (Mhlanga 2015). This is an energy saving process which can be quantified in monetary terms through the EMA system and harvests the benefits of EMA against the costs of implementing the cost-effective process. Without EMA, savings from these processes may not be adequately recorded, thereby underestimating benefits.

Environmental Management Accounting enhances environmental performance by putting in place accounting systems which analyse the benefits obtained from the environment to allow organisations to introduce the use of limited natural resources (eco-efficiency). EMA identifies and measures the full spectrum of environmental costs of current production processes and the economic benefits of pollution prevention or cleaner processes, and integrates these costs and benefits into day-to-day business decision-making (United Nations, 2001b). As Burritt (2005) asserts, businesses use environmental management accounting to minimise the costs of environmental sustainability initiatives through managing waste reduction, material flows and energy consumption. This argument tacitly acknowledges EMA as one of the prime movers of sustainable development.

In many companies, penalty fines are the only documented environmental costs whereas costs of building and operating effluent systems should also be part of environmental costs. Such costs are often classified as normal operating costs which are capitalised in the statement of financial position at the end of the reporting period. The costs of setting up and implementing the EMA system should

be classified as part of environmental costs. The environmental costs are usually hidden in the general cost classifications (Christ & Burritt 2012), which makes it difficult for companies in the mining sector to make sound decisions that are related to environmental management and the development thereof.

There is need for a paradigm shift from traditional recording of Environmental Management Accounting costs in the normal routine financial statements like the statement of comprehensive income and statement of financial position to environmental accounting reports which are specific to the environment. This helps the mining sector to know the exact costs and benefits of environmental management in order to take appropriate actions depending on the outcomes of the reports (decision making). The International Federation of Accountants, provides guidelines for EMA against a growing consensus that conventional accounting practices simply do not provide adequate information for environmental management purposes IFAC (2005). The accounting profession, however, argues that the international accounting standards cover all the EMA details but people do not have the knowledge of how to put EMA into practice. Traditional management accounting does not provide adequate Environmental Management Accounting information and is intended for internal users. Not bound by the externally imposed rules of financial reporting, it tends to be more subjective and uses both financial and non-financial measures, thereby providing more detail than financial accounting. The area of EMA is part of the internal control systems of the organisation which is not visible to outsiders or intended for external stakeholders though the availability of an EMA system can have an impact on the outsiders or external stakeholders.

The aim of this study was to explore how the environmental impact of extractive industries and the mining sector would be more accurately recorded by means of EMA applications. The assessment thus endeavoured to find if EMA enhances sustainability in Zimbabwe's extractive industries.

1.2.Rationale for the Study

Environmental Management Accounting studies are relatively few in the mining sector (United Nations, 2001a). To the researcher's knowledge, such studies are non-existent in Zimbabwe's mining sector which makes this study the first in the area. Therefore, this study will contribute to the body of knowledge by adding the Zimbabwean perspective. This study will enhance the government's ability to improve and/or enhance Environmental Management Accounting systems and applications at national level in line with the United Nations Department of Sustainable Development (UNDSD) mandate to improve management accounting at supranational level. The study will enable different mining companies to have access to greener markets by complying with global reporting initiatives (GRI) in companies which have high environmental impacts. Zimbabwe is facing a challenge to break

into the lucrative global diamond market because of some of these reporting initiatives and regulations which are not privy to developing countries hence; the need for this research to properly position Zimbabwe's mineral resource marketing through the development of an environmental management model framework.

The research has the potential to influence policy changes at national level. It is hoped that the researcher will work with government agencies in Zimbabwe which are set up to promote environmental protection like the Environmental Management Agencies of Zimbabwe (EMAZ) and the Ministry of Environment and Natural Resources. The study comes as the first sector-specific environmental management framework in Zimbabwe to the author's knowledge. The UNDSD encourages the production of sector specific environmental management frameworks because the existing framework developed is more aligned to the manufacturing sector and is rigid in application (United Nations, 2001b). The existing framework is based on the perspective of developed countries which might not be the same for developing countries like Zimbabwe. Consequently, the framework cannot address the unique conditions and situations of Zimbabwe.

In addition to influencing policy changes and working as a benchmark document for Environmental Management Accounting, the study promotes transparency in the sector which is ridden with corruption and reserved for the few politically aligned elites in Zimbabwe (Robb Jr, 2012). The implementation of EMA will enhanced revenue flows to the state and for public benefit. It is reported that in Africa, with the exception of Botswana, many developing countries do not utilise their natural resources for the economic benefit of the general populace (Kumah, 2006). Illicit financial flows will be reduced through systemic implementation of EMA in addition to reducing environmental impacts. Though research shows that the implementation of EMA does not guarantee revenue flows and accrual of benefits (United Nations 2001a), its implementation is a step towards improving decisions and in turn increasing profitability by harnessing the once ignored possible revenue flow areas. Revenues can be in the form of taxes or environmental fines and benefits which accrue through environmental management.

Environmental Management Accounting is believed to be better than conventional management accounting and conventional financial accounting which do not take into consideration the environmental impacts. EMA is both forward looking as well as historical looking and addresses the inadequacies of conventional methods of reporting. EMA records environmental impacts in monetary terms and physical terms which is critical for decision making. Costs are unbundled or disaggregated to correctly measure their impacts on the environment, the public and the company as a whole. Overheads are not allocated to one process or activity but are traced back to their origin and help in

actual costing of systems and processes. Through this, meaningful information for decision making is harvested and the organisation improves its global competitiveness by reducing costs to products and processes at the same time as making profits through environmental efficiency.

Scholars have pointed out weaknesses of Environmental Management Accounting. For instance, Schaltegger, Gibassier & Zvezdov (2013) have argued that EMA is just management accounting and is no different from financial accounting. Others such as Gray (2010a) maintains that what EMA is advocating is already in conventional accounting practices. This is an area of study seeking relevance in the established field of accounting. High costs associated with EMA implementation have also been criticised by the United Nations (2001a) who compare it to short term benefits which are minimal. This is primarily the reason why EMA has not been implemented in SMEs in developing and developed countries. EMA requires a multidisciplinary approach; no single profession can do it because it requires skills from many disciplines which is a challenge in implementation. The skills are required from environmentalists, engineers, accountants, academics and the public input. That is also one of the reasons why there are no implementation standards in the mining sector due to its dynamic and complex nature.

EMA is said to be an area seeking relevance because, firstly, there is no standard definition for EMA even though the United Nations Division for Sustainable Development (UNDSD) has come up with procedures and principles for EMA. Some scholars, companies and governments have come up with different interpretations of what EMA is, with scholars such as Burritt, Hahn & Schaltegger (2002), Jasch (2006a) and Schaltegger & Burritt (2010) maintaining that they have developed a coherent definition of EMA. Secondly, there are no enforceable International, national or regional standards like the IFAC international standards for financial reporting. The guidelines are generalised through frameworks which are not suitable for the mining sector and these frameworks are being advocated at the supranational level by pressure groups which are more concerned with pushing their own agendas. The implementation of these frameworks is biased towards corporate social responsibility in the sense that organisations that practice and have EMA systems do it for public relations and not necessarily out of environmental concerns. Finally, EMA is usually practised in developed countries and when multinationals operate in developing countries, their primary concern is not negative environmental impacts but resource extraction (Tsamenyi, Hopper & Uddin, 2017; Lodhia & Hess, 2014).

In spite of the above perceived EMA challenges, EMA has many benefits which include the quantification of environmental benefits in monetary terms and physical terms. The principle ensures

environmental efficiency through environmental protection and harnessing positive environmental gains or benefits through finding alternative uses of environmental wastes.

Zimbabwe has not fully developed a supporting structure for EMA like developed countries. To the author's knowledge, no studies have been done in EMA and no EMA initiatives have been done except that Zimbabwe is part of EMA initiatives in promoting the government's role in sustainable environmental investments. It is reported in the UNDSD policies and linkages document that Zimbabwe is implementing EMA at supranational level through United Nations Environmental Protection (UNEP) together with countries like Tanzania in Africa. The country at national level does not have any framework. It is the desire of the research to check what UNEP has done and achieved in Zimbabwe to date in promoting sustainable environmental investments which are in line with EMA. This information will be useful to help the researcher understand the direction Zimbabwe is taking in EMA. As other national level developments are made known to the public, the developments of EMA in Zimbabwe have not been brought to the public fore for discussion or input. In South Africa EMA frameworks are being spearheaded by academics through an Environmental Management Accounting Africa Network (EMAAN), with research being undertaken to find out how EMA may be implemented specifically in the mining sector (Rikhardsson *et al.*, 2005). In Zimbabwe the environmental ministry should spearhead the implementation of EMA and the development of EMA frameworks like in Japan where the Ministry of Environment is spearheading the development of EMA frameworks.

Based on the aforementioned there is therefore a deep need to develop a framework for EMA in the mining sector and to ascertain whether or not EMA promotes sustainability in the extractive industries and mining sector of Zimbabwe.

1.3. Conceptual Framework

The Environmental Management Accounting (EMA) concept was advanced around the IFAC EMA guidelines observation which indicate that no EMA frameworks have been developed in the mining sector, service industries and SMEs (IFAC, 2005). The researcher decided to dwell on the mining sector because of its envisaged positive contribution to the Zimbabwe economy with new minerals being discovered and mineral deposits of lime and diamond being unveiled through massive explorations. The research concept is also supported by the United Nations Division for Sustainable Development's (UNDSD) EMA policies and linkages framework as well as EMA procedures and principles framework (United Nations, 2001a, 2001b). These two frameworks intend to act as guidelines to governments on how EMA can be implemented. Their main thrust is on promotion of EMA to governments at national level. Zimbabwe is part of the UN expert working group and it

participated in the development of these frameworks. The question is whether or not Zimbabwe is implementing EMA, and, if implementing, at which stage is it and, if not, what might be the possible challenges being faced. The manufacturing sector of Zimbabwe could have been taken as a starting point of the EMA initiative. This has not been done because the manufacturing sector of Zimbabwe is almost extinct, and many companies are closing which is paradoxically parallel to the reopening of mining companies. The extent of implementation in the manufacturing sector in Zimbabwe may present another possible research opportunity to be looked at as soon as the economy is recovering. Two main focus areas in Zimbabwe are agriculture and mining. The researcher will look at the mining sector only in this study.

The ground-breaking framework which influenced these two guidelines is the EMA framework developed by Burritt *et al.*, (2002), which focuses on modalities of implementing EMA. Other frameworks such as the one developed by Bebbington & Gray (2001) following the sustainable cost calculation (SCC) theme of Gray (1992) failed to ascertaining the sustainable cost in a case study company. The results of the empirical study helped in spearheading EMA ideas.

EMA has many facets which were pointed out by the frameworks cited above. These facets are summarised in the Figure 1.1 below to indicate areas which the researcher considered when forming the conceptual framework of the study.

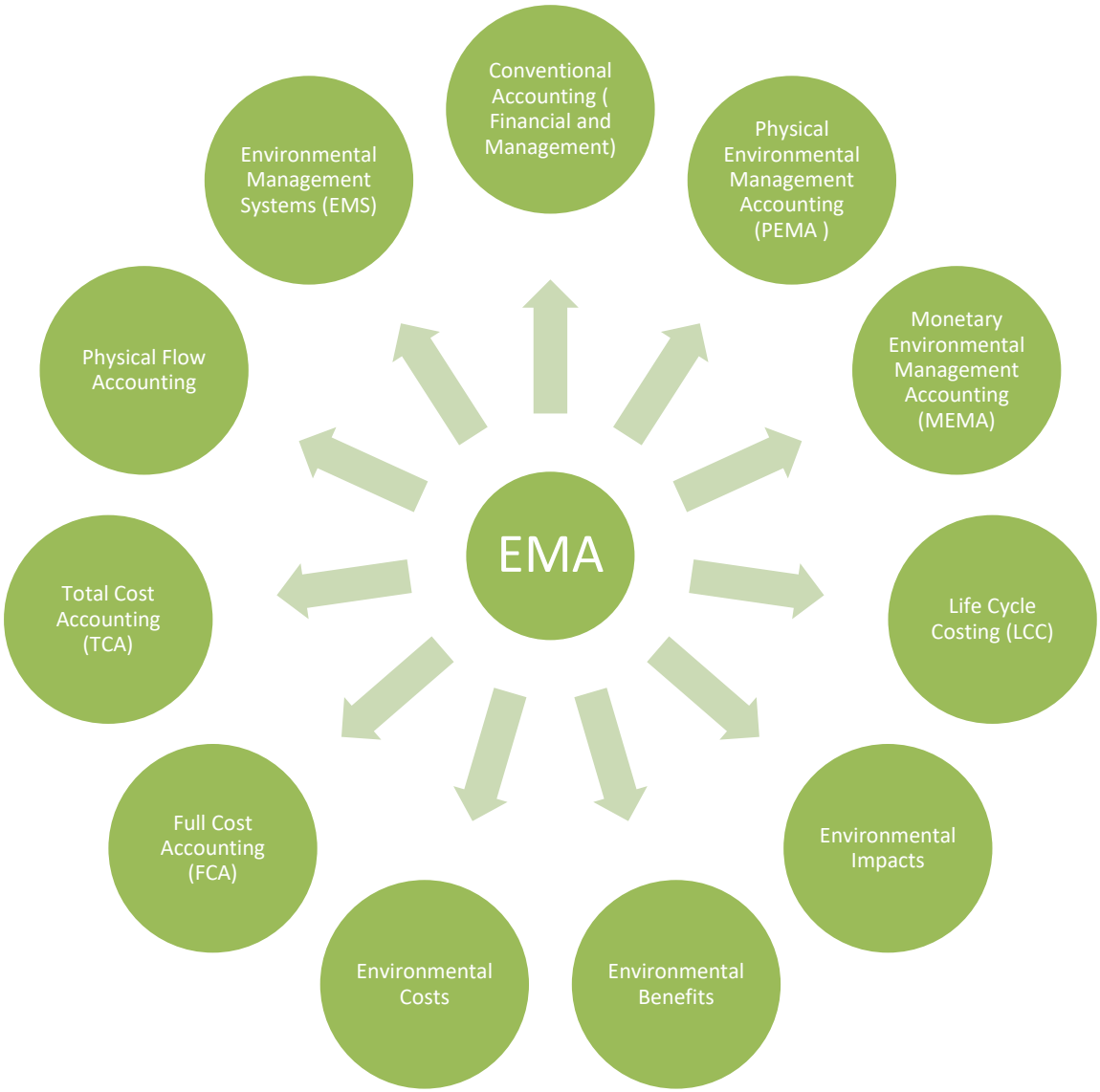

Figure 1.1 Conceptualisation of Environmental Management Accounting (EMA)

Source: Author

Figure 1.1 indicates that EMA was conceptualised as comprising of the surrounding components. The frameworks developed so far indicate that EMA includes the components given above and this study looked at the components which are relevant to Zimbabwe.

1.4.Statement of the Problem

The mining sector and extractive industry is among the main contributors of negative environmental effects, yet in Zimbabwe there is no documented information regarding their Environmental Management Accounting (EMA) systems despite it being a strategic sector. There is limited information about the implementation and impact of Environmental Management Accounting in Zimbabwe's mining sector and extractive industries. To the researcher's knowledge, EMA is an area

of study that has not been explored in Zimbabwe. Lodhia & Hess (2014) argues that EMA in the mining industry is evolving slowly, hence, the real impact of mining and extractive industries on the economy in the long term (sustainability) is unknown. As a premise to this study it is accepted that implementation of EMA enhances sustainable industry and mining development.

1.5.Purpose, Objectives and Research Questions

The increasing demand for environmental performance in industries with high negative environmental impact is a cause for concern. The increase is notable through environmental sustainability studies, particularly, environmental management accounting studies in the mining sector and extractive industries which have been under scrutiny (see, for example Albelda, 2011; Cortese, Irvine & Kaidonis, 2009; Deegan, 2013; Garvin, McGee, Smoyer-Tomic & Aubynn, 2009; Hossain, Momin, Rowe & Quaddus, 2017; Kumah, 2006; Lamberton, 2005; Schaltegger & Burritt, 2010; Schaltegger, Etxeberria & Ortas, 2017; Schaltegger, Gibassier & Zvezdov, 2013; Sequeira *et al.*, 2015). However, there is no unison as to whether environmental management accounting will or will not have a central role in saving the planet earth from harmful environmental effects. Given the need for environmental performance data in both monetary and physical terms in mining and extractive industries, the results of many studies about the impact of sustainability accounting remain questionable. Therefore, the purpose of this research is:

To assess the current and potential relevance of environmental management accounting for sustainability in Zimbabwe's extractive industries.

The research purpose was addressed in line with the following five research objectives (RO) and the accompanying research questions (RQ):

RO1: To investigate how environmental management accounting promotes sustainability.

RQ1: How does Environmental Management Accounting promote sustainability?

Sub RQ: Will EMA promote sustainability in the extractive industries and mining sector of Zimbabwe better than traditional accounting?

The major focus of environmental management accounting is to promote sustainability in different industries as indicated by the Brundtland report definition for sustainable development (WCDE, 1987). Several studies have evaluated the contribution of EMA towards sustainability, yet to date the outcomes remain ambiguous (see for instance, Figueroa, Orihuela & Calfucura, 2010; Gray, 2010a, 2010b; Hansen & Schaltegger 2017; Johnson & Schaltegger, 2015; Phillis & Andriantiatsaholiniaina, 2001; Schaltegger & Burritt 2010

). There seems to be some evidence which suggests that EMA promotes sustainability because of the three pillars of sustainability in the EMA definition proposed by scholars such as Burritt *et al.*, (2002), Christ & Burritt (2012, Jasch (2006b), Lamberton (2005), Schaltegger & Burritt (2010). Different methodologies were used to arrive at the conclusions given by the studies. The current review set out to explore and critically discuss the issues surrounding EMA sustainability with specific reference to the mining sector and extractive industries. The study further explores how EMA potentially promotes sustainable industry and mining development. The research looks at what sustainable development and unsustainable development are in the current mining environment. The study further explores the impact in the absence of EMA, that is, benefits and negative effects caused by the lack of EMA systems. With this first objective, we aim to give an overview of the current state of EMA sustainability highlighting the research gaps and issues in current literature.

RO2: To examine how the government of Zimbabwe currently regulates the mining sector accounting system.

RQ2: How does the government of Zimbabwe currently regulate the mining companies' accounting reporting systems?

Accounting regulation extends beyond the traditional accounting standards (Laughlin, 2007) and the boundary between internal and external environmental costs is increasingly becoming fluid because of changing regulations and emphasis on corporate social responsibility (IFAC, 2005). Hibbitt & Collison (2004) emphasise that environment remains a contentious issue. The issue of regulation and why it exists generates significant debate from the perspective of antipathy and includes environment protection, prevention and conservation. Regulation is an important aspect for full understanding of the relevance of EMA for sustainability. Studies by, for example, Burke & Clark (2016), Kershaw (2005), Luther (1996) and Murombo (2013) indicate that regulation is the starting point towards achieving mining sustainability. The research looks at established regulations, such as, material flow costs, site recovery costs, environmental reporting regulations and standards which are being used and critically examines case studies to establish how the extractive industry and mining sector accounting is regulated. The study looks at the international regulations surrounding the mining sector and the bureaucracies surrounding the development of accounting regulations as explained by Al-Akra, Jahangir & Marashden (2009), Luther (1996)and Tinker (1984). Luther (1996) further highlights that the increased regulation for extractive industry accounting has, in the past, been most effective in times of mining boom, which is the category Zimbabwe's mining sector falls under. Dhliwayo (2014) reiterated that poor mining regulations may also impose unfavourable terms to countries and communities, sowing disputes and undermining environmental sustainability gains. The

second objective, draws attention to Zimbabwe, and examines how regulation in Zimbabwe is helping to push the EMA agenda forward in the context of a developing country. This is against the background that regulation in developing countries is weak and it imposes requirements on companies and information to be recorded (Sinding, 1999). Sinding (1999) further suggests that the mining industry has tight environmental regulations, which is diametrically opposed to views shared by Cortese *et al.,* (2009) and Luther (1996) who explains the paucity of mining accounting regulations in developed countries because it presents severe problems. Qian *et al.,* (2015) further supports the notion by pointing out that even in emerging markets regulation is not strong despite the extractive industry being regulated. The gap then becomes apparent as pointed out by the United Nations (2001a) that the potential for promoting EMA concepts via accounting regulation needs further discussion and investigation.

RO3: To discuss the current occurrence and significance of EMA in the mining sector.

RQ3: What is the current occurrence and significance of EMA in the mining sector and extractive industries?

The importance of environmental management accounting has been under the microscope for the past twenty years (Thornton, 2013). With scholars such as Gray (2010a) questioning the relevance of EMA over time, a consensus has not been reached as to the importance of EMA and the role of accountants in the environmental management accounting application. EMA proponents such as Burritt & Schaltegger (2010) posit that EMA is an area seeking relevance without the sustainable contributions to improve environmental performance and to guide the investors' decisions. IFAC (2005) came to the aid of the EMA proponents by highlighting the importance of EMA, although they indicated the difficulties being faced in developing sector specific guidelines. The accounting profession has not managed to develop specific guidelines, with the whole accounting profession being found wanting with regard to the general guidelines which are difficult to use in the sector (IFAC, 2005). To address the third objective, we researched the opinions of the professionals in the field who are knowledgeable of EMA in the extractive industries. The research established the appropriate definition and demarcation of the study based on evidence from the literature. The definition for EMA differs from one organisation to the other depending on the need (Schaltegger & Zvezdov, 2015). This research established the meaning of EMA and its components in the mining sector and extractive industries.

RO4: To determine the extent to which Zimbabwe's mining sector and extractive industries implement Environmental Management Accounting.

RQ4: How is Environmental Management Accounting being implemented in the extractive industry and mining sector of Zimbabwe?

Environmental Management Accounting's effectiveness is noticeable once implemented. The theoretical aspects are not important without the practical implications. Through implementation, the gains of sustainability accounting can be obtained. The benefits as well as the hidden costs also become apparent. The implementation, according to Jasch (2006b), is a process which requires the combined efforts of different groups of people like environmentalists, accountants, engineers and the community. The fourth question, specifically addresses issues to do with the implementation of EMA. This is emphasised in mining companies who are operating in developing countries to check if they are doing the same thing in these developing countries. Multinationals take advantage of the relaxed unregulated operating environment and neglect their duty in relation to environmental accountability (Tsamenyi, Hopper & Uddin, 2017; Lodhia & Hess, 2014;). The mining sector is known for its complex operations which make it difficult for implementing systems like EMA (Sinding, 1999). The fourth objective come as a follow up to the work which was done by UNEP (United Nations, 2001b) working with governments globally to further EMA initiatives. The research checks whether EMA is being implemented, the specific processes being taken in the implementations, the gains as well as the challenges being faced in the implementation of EMA.

RO5: To establish a model framework for the implementation of EMA in Zimbabwe's mining sector

RQ5: What will be the model framework for EMA in Zimbabwe's mining sector?

The research culminates in the development of a framework for the implementation of EMA in Zimbabwe and other developing countries with active mining and extraction industries. The framework is based on best practices adopted from empirical evidence gathered from developed countries implementing EMA. A framework acts as a blue print for implementation of EMA and provides a foundation for future work in EMA. The development of IFAC (2005) guidelines was based on frameworks developed by *Burritt et al.*, (2002), Lamberton (2005), United Nations (2001a), (2001b). Other scholars have developed frameworks for their respective countries (see, for example, Kamruzzaman 2012). This framework considered issues proposed in other frameworks working as a foundation for other countries in the development of their own frameworks. The evidence obtained from the primary data collected in this research was incorporated in the model EMA framework. With this fifth objective, we elaborate on the need to develop a model framework for implementing EMA. The model can be adopted in other developing countries with similar operating and economic conditions as Zimbabwe.

1.6.Assumptions of the Study.

The major assumption of the study was that a start has been made on EMA. The concept is not foreign, but so far the potential of EMA has not been achieved. Environmental Management Accounting is necessary to achieve sustainable extractive industry and mining development. It was assumed that EMA is being implemented in the mining sector and government is taking a leading role in promoting EMA systems through its agencies, namely the Environmental Management Agency of Zimbabwe (EMAZ) and the Ministry of Environment. It was assumed that the managers in mining companies are aware of EMA. EMA has been clearly defined in company manuals, and the modalities of its implementation are clearly given and laid out. The environmental management reports together with sustainability reports are being produced and are available in public domains. The information obtained from environmental reports is very important in making environmental related decisions, which include reducing negative environmental impacts and harnessing the environmental benefits. The information provided by environmental reports is not available in conventional management accounting systems and records. It was also assumed that EMA helps in promoting sustainable development in the mining sector.

It was assumed that environmental costs, benefits and impacts can be quantified in monetary terms and physical terms. The company's financial records include environmental costs and benefits which are hidden in other overheads. Government is willing and spearheading the promotion and implementation of EMA. It was further assumed that lists of accounts/ ledger accounts or charts of accounts would be provided by different mining companies under consideration for analysis and development of a suitable and applicable framework in the mining sector. The Ministry of Mines and Mining Development together with the Chamber of Mines in Zimbabwe would also help the researcher to get information about the strides and regulations that are being made and at the same time are governing the mining industry of Zimbabwe. Above all, the Ministry of Mines and Mining Development would grant permission for the research to be carried out in their mining jurisdiction.

Related to the above assumptions, data would need to be made available for this research. Interviews would be conducted and data would contain key variables to answer the research questions. The mining companies would somehow have environmental impacts/costs and benefits to be salvaged.

The last assumption made was that the government of Zimbabwe would be interested in knowing the current status in as far as the implementation of EMA was concerned from an independent academic research in the mining sector. This helps to influence policy changes in the mining sector and extractive industry of Zimbabwe.

1.7.Significance of the Study

This study fills the knowledge gap in the impact of Environmental Management Accounting implementation in Zimbabwe. The study promotes environmental efficiency by implementing the appropriate Environmental Management Accounting techniques and tools. It is hoped that EMA will promote the achievement of sustainability in the mining sector and extractive industries. It is expected that a proper EMA system will contribute to sustainability through enhanced transparency and accountability. Sound economic decisions can be taken only if and when management and regulators are aware of the real cost of extraction and mining in addition to the benefits of having the EMA systems in place. Zimbabwe is on record for having large mineral reserves specifically of platinum, chrome and diamonds but the country remains poor despite being in the mining industry for a long time. There is no remarkable development which has been brought about by the extractive industry. The mining revenues are too little to benefit the country and the general populace of Zimbabwe. It is a personal view of the researcher that EMA will somehow help in unlocking the potential benefits of extractive industries for the overall growth of the economy.

Global competitiveness of Zimbabwe's mining products can be enhanced if the mining companies are seen to be embracing the current trends in the environmental revolution by being able to adopt the 'green' revolution through EMA systems. The studies (for example, Deegan, 2013; IFAC, 2005;KING IV, 2016; Thornton, 2013) indicate that companies that are environmentally conscious tend to have globally competitive products which are marketable in international green markets and the products attract high end "green" potential investors. This current research enhances the ability of different companies to track their environmental costs (and benefits) and come up with ways of reducing the costs (or increasing benefits) in a way that is beneficial to the company and the environment. This entails the use of few resources to retain high incomes or the efficient use of the environment (eco-efficiency). The results obtained in this study are vital in achieving sustainable industry and mining development in Zimbabwe.

This research, additionally, contributes to the existing body of accounting theory by systematically providing evidence of how EMA differs from conventional or traditional accounting as it is known in the accounting profession. Traditional or conventional accounting does not make a distinction between environment related costs and other business operating costs in reporting, thereby affecting product pricing and decision making at strategic levels. This study further explains the need to have separate EMA reports which give emphasis to environmental impacts, at the same time showing the inadequacies of conventional accounting which EMA addresses. It is apparent that hidden environmental costs in traditional accounting are discovered through this research and the benefits of

comprehensive EMA systems are revealed. The link between EMA reporting and strategic environmental decision making is addressed by this research. Management, in general, will be able to make strategic decisions which reduce environmental impacts while at the same time increasing environmental efficiency and profitability through the implementation and use of EMA systems.

Government as a policy holder will be interested in identifying benefits of proper implementation and management of EMA to the fiscus. Modalities to properly run EMA, as per commitment made in the expert working group of UNDSD in promoting government role in EMA, can be formulated through this study and the framework specific to Zimbabwe developed. This study is a move towards achieving sustainability in the sector. The research also provides the basis or skeleton for policy evaluation.

1.8.Delimitations of the Study

In this study, EMA is confined to Physical Environmental Management Accounting (PEMA) and Monetary Environmental Management Accounting (MEMA) with their external reporting components. The researcher is more interested in the monetary part of EMA, although physical EMA was considered to understand where the monetary parts of EMA come from. The actual recording and reporting of environmental transactions in monetary terms in the books of accounts was checked through environmental reports, financial reports and sustainability reports.

The researcher considered all environmental impacts which build up EMA as indicated in the conceptual framework on Figure 1.1. The physical flow of resources was mapped in this research to establish all possible cost and revenue areas within the EMA system. The researcher used case studies through literature analysis and publicly available environmental reports. Interviews were conducted where the publicly available reports did not provide adequate information to achieve the objectives of this study.

1.9.Limitations of the Study

The key limitation in this research is the lack of aggregated data on mining activities from the Chamber of Mines and the Ministry of Mines and Mining Development in Zimbabwe. This data includes a full set of environmental reports and sustainability reports from all active mines. There is a lack of information regarding the geographical spread of mining companies in Zimbabwe. Data which shows active and inactive mining companies in Zimbabwe is not publicly available. The researcher had to depend on other independent USA data sets like the US Geological survey which has information about all active mining companies in developing countries.

The mining sector of Zimbabwe is a highly protected sector, which is difficult to penetrate with areas like the Chiyadzwa diamond fields which are heavily guarded and protected. Information from these areas is not circulated easily to the public domain and the research had to rely on good networks to get the necessary data about EMA activities, external environmental impacts as well as internal environmental impacts. To determine the level of implementation in EMA, the researcher needed to participate in the production of financial reports and the day-to-day capturing of data and costing systems of the mining industry to appreciate the level of implementation of EMA in the sector. The researcher spoke to few decision makers in the mining industries to get information using unstructured interview techniques which was a challenge and a limitation in this study.

Most of the publicly available data on mining is on environmental economics and national accounting which were not very useful for this specific research, though some valuable information was salvaged from these reports. This data is available on the South African Statistics website. The Zimbabwe Statistics agency does not have this information but some inferences were made for those mining companies which have branches in South Africa and Zimbabwe, especially in the cement industry.

The political nature of the mining resources makes it very difficult to reach out to other mining sites and companies. Any person who tries to do that is treated with suspicion. This therefore means conducting field work in companies like that will put the life of the researcher in great danger. The researcher used social networks to reach mining companies and also applied for permission to carry out research from the Chamber of Mines, Ministry of Mines and Mining Development, which was granted after a long period of waiting and follow ups.

The secondary data used for this research was a limitation since the data was not assembled for this study which then means that some important information was missing to adequately address the research problem. The researcher had no choice but to rely on available data and conduct interviews to strengthen the validity of the data. However, important information of value to the researcher and policy makers was obtained in this study. The information obtained from this research will contribute to the national discourse on EMA in the proposed mining policy reforms.

1.10. Theoretical Framework

In this section of the study the researcher will discuss the theory that makes up Environmental Management Accounting.

1.10.1. Sustainable development

The concept of sustainable development lies in our recognition of humanity living within the limits of our planet's overall resources and carrying capacity (IFAC, 2011). The International Federation of

Accountants (IFAC) defines sustainable development as dealing with economic, environmental and social issues in a way that meets both the present and future human needs without compromising the viability of the natural earth system we depend on. This definition agrees with the World Bank (1987) of sustainable development which recognises any development that meets the needs of the present without compromising the ability of the future generations to meet their own needs. These needs may be classified into three pillars of sustainable development, namely, social, economic and environmental sustainability. These three pillars need to be balanced to achieve sustainability. The Environmental Accounting definition considers only two of these pillars of sustainable development, which are economic issues and environmental issues. In most cases Environmental Accounting does not take into consideration the social concerns which influence our comprehensive understanding of sustainable development. The development and implementation of Environmental Management Accounting systems should be viewed as a way of encouraging sustainable industry and mining development.

Similarly, mining lacks all the pillars required to achieve sustainable development. Mining in itself can never be sustainable due to its extractive nature (Dhliwayo, 2014; Murombo, 2013). It can contribute to sustainable development only through the investment of generated revenue in human and physical capital. Investments toward the development of costly yet beneficial EMA systems can prove to be a contributing factor of the mining sector and extractive industries' sustainability. The concept of sustainable mining is perceived as a 'smokescreen' covering the flagrant global capital interest and its reaping of profits from the developing countries (Murombo, 2013). Some companies are working in good faith to make mining sustainable, for example, the Zimbabwe Platinum Mining company (ZIMPLATS) which entered into partnerships with local communities through share ownership schemes to leave a legacy of wealth. The partnerships can work very well if there is a well-established EMA system which promotes transparency and accountability. Total sustainability is difficult to achieve but some progress towards achieving it has certain merits.

1.10.2. Sustainable extraction in mining

Sustainable extraction in mining entails that mining should possess qualities such as social responsibility, economic viability and environmental responsibility, but sustainable mining in itself can never be enough. For total sustainability to be achieved, it needs to be supported by systems like EMA which operationalise sustainable mining. IFAC (2011) points out that sustainable development is not a fixed state of harmony, but rather a process of change in which the exploitation of resources, the direction of investments, the orientation of technological development, and institutional change are made consistent with the future as well as the present needs. The route to achieve sustainability

in the mining sector is to consider the long and short-term impact of economic activities, that is, things bought, investments made and waste in addition to pollution generated by the natural and human resources on which they depend to avoid irreparable damage to the productive capacity of these resources (Soyka, 2013).

Soyka (2013) succinctly explained sustainable extraction in mining as mining which promotes responsibility to social circles, taking heed of ecological factors and contributing positively towards the economic growth of the nation.

In the next section, the researcher will discuss the effectiveness of well-crafted environmental regulations in promoting transparency and accountability, thereby fostering sustainability in the mining sector. Once the state becomes transparent and accountable to communities in which mining activities will be taking place, that alone promote sustainable development.

1.10.3. Regulating the extractive industry and mining sector

In order to understand the impact of EMA in Zimbabwe's mining sector and extractive industries, there is need to first understand the regulatory framework within which the industry is operating. The regulations within a particular setting are the bedrock for the achievement of goals and objectives of any institution. Operating without regulations or a framework is a cause for problems within a society, in this setting, of the mining sector and extractive industries. Regulations or the regulatory framework set the pace for promoting sustainability in the mining sector. Zimbabwe is part of the expert working group on improving the government's role in the promotion of Environmental Management Accounting established by the United Nations Commission on Sustainable Development (United Nations, 2001a). This shows that the government of Zimbabwe is interested in promoting EMA.

Environment is the space we live in (Gemmell & Scott, 2013). The environment is controlled by a body of law and in Zimbabwe this body of law is often referred to as the environmental management regulations. The body of law contains the Constitution of Zimbabwe, Mines and Minerals Act Chapter 21:05 of 1961, Environmental Management Act Chapter 20:27, laws governing the administration of trade and dealings in mineral resources, Communal Lands Act Chapter 20:04 as read with the Traditional Leaders Act Chapter 29:17, the Rural District Council Act Chapter 29:13, National Environmental Policy and Strategies of 2009, Gold Trade Act Chapter 21:03, Precious Stones Trade Act Chapter 21:06, Diamonds Policy and Zimbabwe Mining Development Corporation Act among others (Chibememe *et al.*, 2014; Murombo 2013). Before any mining activities take place, the body of laws and regulations should be consulted using different responsible bodies like the Zimbabwe Environmental Management Agency. These are the enforcers of the Environmental Management Act

Chapter 20:27 and other different environmental protection related laws and regulations applicable to Zimbabwe.

The sector is largely regulated by the Mines and Minerals Act (Chapter 21:05) of 1961, which has been largely described by Dhliwayo (2014:9) as very old and obsolete, in his review of the Zimbabwe Draft Mineral policy. The Act indeed is dated 1961 and has not been updated since then. This is the Act which is currently being used to regulate the mining sector alongside other policies such as the Zimbabwe Diamond Policy. The Act is oriented towards mine extraction and not the sustainable management of mines; hence, there is no mention of Environmental Management Accounting in the Act and its impact, besides the fact that Zimbabwe is part of the United Nations expert working group in EMA development. Poorly crafted mining regulations have imposed unfavourable terms in the country and communities for a long period, thereby undermining the pursuit of sustainable development goals like poverty reduction and sustainability (Dhliwayo, 2014).

The Environmental Management Agency of Zimbabwe (EMAZ) enforces the environmental regulations in Zimbabwe. The Marange diamond field case studies show that EMAZ is struggling to subject the mining companies to Environmental Impact Assessment (EIA) (Murombo, 2013) which is very important before any mining can commence. EIA is of paramount importance because it can feed into the EMA system of the mining company to achieve both the short-term and long-term strategic EMA goals. The EIA might work as a road map to the full utilisation and realisation of EMA benefits to the mining sector and extractive industries, not only in Zimbabwe but also in South Africa and other developing countries. The current Mines and Minerals Act of 1961 does not give a provision for EIA to be conducted before commencement of mining activities. Once a mining company is granted the licence, it can start operating without complying with environmental laws. This shows the weakness in the current regulatory framework within which Zimbabwe is operating.

The Environmental Management Act makes provisions for Environmental Impact Assessments (EIA) to be conducted in order for the government of Zimbabwe to stipulate the regulations which are supposed to be adhered to before, during and after the implementation of projects which include forestry, mining and quarry, and infrastructure development. The EIAs are there to ensure sustainability in the mining sector and extractive industries. The EIAs are more of compliance regulations which do not necessarily ensure that the environment is efficiently being used. The assessments are mostly adhered to in order for the company to obtain an operating licence. After the licence is obtained, the stipulations or recommendations of the EIA are ignored though the enforcement agents are available. These are ignored due to a number of reasons some of which are

the lack of resources in the developing countries, the lack of knowledge in environmental management and the feasibility of doing compliance audits.

The Environmental Impact Assessments work as a framework for Environmental Accounting (EA). EIA is a road map to mining sustainability which can only be achieved by putting in place appropriate EA systems (Sinding, 1999). EA systems ensure that the requirements of the EIA are strategically achieved by being implemented in the day-to-day activities and operations of the mining industries. The lack of an appropriate EA system indicates the lack of sustainability (environmental, economic and social) in the mining sector and extractive industries. It also shows the inability of the enforcing agents to operationalise the EIAs and also substantiate the notion that the EIAs are just a regulatory requirement that does not add value to the country, hence, the sustainability of the industry. The EIAs usually address the visible and invisible environmental impacts of the mining activities before, during and after the extraction of mineral resources. EA encourages the continuous improvements of EIA by finding the best ways of improving environmental efficiency at the same time minimising the damage to the environment. The ability to continuously improve environmental efficiency promotes extractive industries and mining sustainability.

Murombo (2013:5) states that most post-colonial states have not independently developed models to sustainably use natural resources. This idea is reflective of Zimbabwe's current state which is using the 1961 Act as a model. The country is in the process of drafting a Mineral policy which embraces the 21st century developments. The models not independently developed include the EMA systems among other models which were stated by the writer, but outside the scope of this research.

Zimbabwe is estimated to have the second largest global reserves of platinum and chrome after South Africa and with potential to supply 25 percent of the world's diamond market (Dhliwayo, 2014; Mobbs, 2014). This concurs with Murombo (2013) who posits that South Africa and Zimbabwe are rich in mineral resources and yet Southern Africa remains the poorest part of the world, based on World Bank and UNDP Human Development Index Statistics. Zimbabwe is now ranked as one of the top producers of rough diamonds. Despite having risen to being a top producer of diamonds globally, Zimbabwe has not generated any significant jobs and revenue from its exploitation and trade in diamonds. The Fraser Institute (2014) of the Canadian think tank, describes Zimbabwe as among the worst jurisdiction for mining investments. This is hinged on the regulations surrounding the mining sector. This clearly indicates the need to look at the regulatory environment within which Zimbabwe is operating and also focus on the development of appropriate EMA systems that enable Zimbabwe to unlock the potential of its mineral resources.

Environmental pressure groups lobby and advocate for the development of appropriate regulations for the mining sector. These pressure groups include the Extractive Industries Transparency Initiatives (EITI) which is concerned with disclosures and the publication of mineral revenue and payments (UNDP, GEF & OSISA, no date). Zimbabwe has been hesitant to join the initiative and has a domestic version of the initiative called the Zimbabwe Mining Revenue Transparency Initiative (ZMRTI) which was launched to promote the disclosure of mineral revenue and payments. The African Mining Vision (AMV) is another pressure group which seeks to promote the sustainable mining sector (UNDP, GEF and OSISA, no date). The Zimbabwe Environmental Law Association (ZELA), Environmental Management Agency of Zimbabwe (EMAZ), Publish What You Pay (PWYP) and the African Initiative on Mining, Environment and Society (AIMES) are among the pressure groups or civil society organisations that lobby and advocate for the development of appropriate regulations for the Zimbabwe's mining sector (Dhliwayo, 2014; Murombo, 2013).

The need to achieve sustainability and sustainable development in most cases is driving legal reforms of the mining and environmental codes. The mining and environmental laws in South Africa have all recently been overhauled to embed good environmental practice aimed at promoting sustainability, the process which is underway in Zimbabwe through the development of the mineral policy. There is no mention of EMA systems and policies in mining regulations under development in South Africa and Zimbabwe respectively. The draft Zimbabwe mineral policy has a section which speaks about environmental stewardship and social responsibility. This stewardship may be taken to be inclusive of EMA systems development.

There is need for a complete overhaul of the mining regulatory framework if mining is to be sustainable (Murombo, 2013). The mining regulations currently do not focus on sustainability, but on the extraction of resources only. Such regulations do not encourage the development of an EMA accounting system or the implementation framework. Mining regulations are a fundamental means of securing sustainable development (Gemmell & Scott 2013). The reforms of mining laws must be embedded within sustainability, social equity, and community participation.

1.10.4. Mining taxation

Mining taxation in Zimbabwe is regulated by the Zimbabwe Revenue Authority (ZIMRA) through the use of the Income Tax Act, VAT Act, the Capital Gains Tax Act, Finance Act and many more Acts. Mining companies are assessed in a similar manner to that of traders and have allowances that they claim in the form of Capital Redemption Allowances (CRA) on capital expenditures. Different methods are used in determining taxable income. The methods include New Mine Basis where capital expenditure is claimed in full in the first year of operation and then claimed when incurred in

subsequent years; Life of Mine basis where the capital expenditure is spread over the life of the mine or number of years the mine is expected to be in operation; and Mixed basis method which combines the New Mine Basis and the Life of Mine Basis method, where expenditure incurred before the first year of production is spread over the life of the mine while current capital expenditure is claimed in full.

A presumptive tax of two percent of gross sales is collected by appointed agents who buy precious metals from small scale miners. The agents include Mineral Marketing Corporation of Zimbabwe (MMZC), Reserve Bank of Zimbabwe (RBZ), Fidelity Printers and any other person appointed by the commissioner. Corporates are liable to pay 25 percent on taxable income for mining companies in line with the Income Tax Act. Royalties should be paid on disposal of minerals calculated at gross sales value. Capital gains tax is paid on disposal of immovable property and marketable securities at 20 percent or five percent where the assets were acquired prior to 1 February 2009. Assessed losses in the mining sector are carried forward indefinitely unlike in other trades where they can be carried forward up to seven years.

The state and the community are concerned with the distribution of revenue generated from mining activities. The Zimbabwe's legislation provides for mining companies to pay royalties and taxes to the state. The most important thing to know is how much the state is willing to share with the affected communities in the mining areas and how much the state is getting from royalties and taxes. Mining companies argue that there are no provisions for sharing resources with the communities in the current legislation governing mining operations. This brings out the issues of transparency and accountability. Transparency is a pre-condition to accountability (Dhliwayo, 2014). The absence of effective legislation provisions in mining to ensure transparency and accountability in how governments decide and collect taxes and other revenue from mining companies is a major problem.

1.10.5. Current accounting practices in Zimbabwe

Zimbabwe has a history of strong accounting professions (World Bank, 2011). The accounting practices pertain to the principles, rules and regulations governing the accounting practice. Zimbabwe adopted the International Financial Reporting Standards (IFRS) framework for reporting. The country uses the accrual basis for reporting in most private and public institutions, and is trying to adopt the cash basis of accounting through the introduction of the International Public Sector Accounting Standards (IPSAS). These standards are in a trial phase of implementation in the public sector which can see Zimbabwe moving from accrual basis of accounting to cash basis. The cash basis method of accounting is being implemented by non-governmental organisations like UNICEF among other non-

governmental organisations in Zimbabwe. Zimbabwe's accounting profession is regulated by the Public Accountants and Auditors Board of Zimbabwe (PAAB (Z)).

The profession follows a different set of standards in professional practice that is coming up with different sets of accounting reports in line with the requirements of the Companies Act. The standards which are currently in use are the International Financial Reporting Standards (IFRS), International Accounting Standards (IAS) and International Standards on Auditing (ISA). These are the main standards which are used by different companies though some companies are still using the British Generally Accepted Accounting Standards (GAAP). The recommended standards to be used are the standards developed by the Internationals Financial Reporting Standards Board (IFRSB) which are the IFRS, IAS, and ISA. These standards come with the basic frameworks for implementation and guidance documents.

Companies are required by the guiding standards (IAS1) (IASB, 2010a) to come up with a full set of financial statements which include the following:

1. a statement of financial position as at the end of the period;
2. a statement of profit or loss and other comprehensive income for the period;
3. a statement of changes in equity for the period;
4. a statement of cash flows for the period; and
5. notes comprising a summary of significant accounting policies and other explanatory information.

The statements should be produced at the end of each financial year for publication depending on whether the company is a private or public company, following the specifications and requirements of the Companies Act.

The mining sector and extractive industries' companies, like other companies, are required to produce the financial statements at the end of the financial period, which in most cases is annual, for publication. The financial reports should comply in all material terms with the international accounting standards when it comes to reporting. The accounts are prepared in a traditional way showing the income and expenses (through the statement of comprehensive income), non-current assets, and equity and liabilities (through the statement of financial position). Explanation notes usually accompany these statements to elaborate on areas which are not clear in the statement and to explain issues like the going concern of the company which has to be in the form of a statement that is given by management and the auditors to assure the general stakeholders of the company's ability to continue in operation for a foreseeable time in the future. The notes might include issues to do with the company's corporate social responsibilities. This section is usually selfishly used by companies

to express their goodwill to the communities as a marketing tool and to try to portray a good image to the public.

The notes section in the mining and extractive industry is the area where the company's environmental reports are found, which in most cases are not regulated by any standards. It also portrays the information that the companies see necessary to be revealed to the general public. These reports are not regulated by law. The companies usually report information that they want the public to know, and these reports act as a marketing tool. The official reports should be mandatory (Sinding, 1999). The mandatory reports are those the companies should submit under local legislation to obtain operating licences. There is, therefore, no sustainability in the reporting and there are no checks and balances in the current reporting systems. The environmental reports in most cases are narrative and they are not in monetary terms. The social costs need to be quantified to make meaningful sense and value for the people. They also need to be standardised in terms of what should be reported and what should not be reported.

So far, one of the two broad categories of accounting in Zimbabwe has been considered. Management accounting is another category which is silent from external users, but very useful in coming up with the external financial reports. This category brings about EMA in a better perspective. There are many links between financial accounting and management accounting (Jasch, 2006a). Management accounting is not governed by laws or reporting standards while financial accounting is governed by laws and reporting standards. EMA suffers from the same weaknesses and limitations of management accounting for decision making purposes. Many companies do not have a comprehensive distinction between management accounting and financial accounting. Data used for internal decision making is used for external reporting as well with minor changes. Jasch (2006a) further explains that doing EMA is simply doing more comprehensive management accounting while wearing an environmental hat that opens the eye for hidden costs.

The current accounting practices in Zimbabwe do not have provisions for environmental financial reports. There is no framework that is specifically followed by the companies besides the framework and implementation guidelines which are available from international organisations like IFAC and renowned scholars in the field of Environmental Management Accounting. This research tries to address this gap in reporting and coming up with an implementation framework that shall possibly influence policy changes in Zimbabwe's mining sector and extractive industries in the adoption of EMA.

The current accounting practices in Zimbabwe use the traditional way of recording, tracking and analysing transactions. There are no specific environmental reports that are in financial terms and can

clearly show the financial environmental impact, that is, costs and benefits of the operations on the environment. The specific reports are crucial in order to evaluate if the companies are making profit or procrastinating the environmental costs of environmental remediation to the future generations after the extractions of the non-renewable resources are done. Examples of these procrastinations are seen in acid waters and environmental pollutions that are caused by companies which do not take responsibility for the environmental costs after the mining activities are completed. If the costs that are created after the extraction of the resources are completed were to be calculated in small quantities and maybe extrapolated into the future, the companies would be in a position to ensure that they take mitigating measures to reduce the costs and at the same time maximise benefits by ensuring minimum damage to the environment. These initiatives are only achieved if the companies are able to have comprehensive and robust EMA systems that take into consideration the full spectrum of environmental costs and benefits by reducing them into day-to-day business operations. The moment environmental costs and benefits are reduced to paper in financial terms, strategic decisions that counter the continuous environment costs can be made and implemented.

The current accounting practices in Zimbabwe do not make it mandatory for companies to produce environmental financial reports, which are crucial for sustainability in the mining sector and extractive industries. The reports are not punitive, but, internationally, these environmental reports are a way of unlocking lucrative markets for companies (green markets). Environmental reports are a way of showing and doing corporate social responsibility. The companies in the mining sector and extractive industries usually export their products, hence, the ability to implement EMA systems will promote the potential to unlock green markets which attract potential investors and lucrative returns.

1.10.6. Environmental Management Accounting

Environmental Accounting (EA) has been defined as an external monetary and physical accounting of the environmental costs and benefits (Alcouffe, Berland & Dreveton, 2010). EA is outward looking and focuses on reporting to the external stakeholders through environmental reports or environmental financial reports. There is lack of consensus in the literature in defining EA as external looking or Internal looking. Authors like Burritt & Saka (2005) and IFAC (2005) are of the opinion that EA is external looking and provides information to external stakeholders while EMA provides information for internal decision making. In my opinion EA is internally and externally oriented. EA is internal in the sense that it feeds into the EMA system and external in providing environmental reports for different stakeholders. Bartolomeo *et al.,* (2000) point out the importance of defining these terms at the onset of the research to guide readers regarding the context of EA.

The term Environmental Accounting (EA) has been loosely and ambiguously defined (Bartolomeo *et al.*, 2000) to mean different things to different companies. Environmental accounting is broad and consists of different components like Full Cost Accounting (FCA), Total Cost Accounting (TCA), Environmental Cost Accounting (ECA), Natural Resources Accounting (NRA) and Environmental Management Accounting (IFAC, 2005). By loosely defining environmental accounting, it becomes the process of analysing and recording of environment related costs and benefits in financial reports. However, Sinding (1999) explains EA as a data gathering and communication exercise which takes environmental work a step ahead by following up on the predictions contained in the environmental impact assessments (EIA). The gathered data in the form of environmental costs and benefits is communicated through accounting channels in the form of environmental reports for decision making purposes. Environmental accounting can only be applied in existing companies unlike environmental impact assessments which are done before the mining operations are conducted (outside existing companies).

As indicated above, the focus of EA is broad because it consists of disclosure of environmental information in the context of financial accounting and reporting; assessment and use of environment related, physical and monetary information in the context of EMA; and estimation of external environmental impacts and cost which is referred to as Full Cost Accounting (FCA) (IFAC, 2005). FCA accounts for stock and flow of natural resources and considers environment-related physical and monetary information in the context of sustainability accounting. EA reports are regulated by the law in most cases.

Full Cost Accounting deals with the estimation of external environmental impacts and costs. The Full Cost Accounting concept was developed to ensure that decisions which consider the total external wider environmental cost and impacts are made. The accounting and reporting of these external economic impacts is not very common in many organisations due to the complexities involved in reporting external environmental impacts as well as the enormous costs involved to develop an external reporting system. FCA should not be mistaken for EA or EMA because its main emphasis is on accounting and reporting the business' wider external environmental impacts. Environmental impact is calculated in terms of monetary value. The monetary value of environmental impact is termed 'social cost' which is the cost of negative externalities (Burritt & Saka, 2005). The scope of FCA is broad and the organisation has to define and clarify what is meant by external environmental impacts. In many cases where the full cost method is used in accounting for environmental impacts, the company strives to use a favourable full cost method (either avoidance cost method or the damages cost method). The society is made to cover for the difference between the recorded costs and actual environmental harm of which the society will never be able to do, and evidence of this claim is in

environmental degradation (Alewine, 2010). This research tries to minimise the use of such kind of decisions which are somehow selfish by nature and promote the use of favourable methods which minimise environmental damage and at the same time give benefits to the business.

Environmental Management Accounting is a branch of Environmental Accounting that deals with the recording of business environmental transactions for internal decision making. There are many definitions of Environmental Management Accounting as given by Bartolomeo *et al.*, (2000), Burritt & Saka (2005), Burritt *et al.*, (2002), Christ & Burritt (2012), IFAC (2005), Jasch (2003), United Nations (2001a), and Xiaomei (2004). International Federation of Accountants acknowledges the need for standardising EMA definition. In the same vein of standardising the EMA definition, this study adopted the United Nations definition for EMA which is stated as "a mechanism to identify and measure the full spectrum of environmental costs of current production processes and the economic benefits of pollution prevention or cleaner processes and to integrate these costs and benefits into day-to-day business decision-making". The UN definition encourages the adoption of EMA into day-to-day business decision making which this study is trying to adopt and incorporate into the mining sector and extractive industries in Zimbabwe. The definition of EMA as given by UN covers both the cost and benefit components of EMA. It does not, however, make a distinction between monetary and physical components of EMA as stated by Burritt *et al.*, (2002), who propose that EMA be defined as a generic term that includes both Physical EMA and Monetary EMA.

EMA is inward looking and its reports are specifically for management purposes and not for external use. Strategic environmental decisions are usually derived from EMA reports. The effectiveness and efficiency of an environmentally driven system are derived from a properly crafted EMA system. This system ensures cost saving as well as market protection by being viewed by the public as an environmentally friendly company (Kurniati, Rahadi & Danial, 2010). Sustainability is enhanced by a proper EMA system. EMA is a subset of Environmental Accounting (IFAC, 2005). Environmental Management Accounting consists of two major areas which are Monetary Environmental Management Accounting (MEMA) and Physical Environmental Management Accounting (PEMA). These two categories work hand in hand as the Physical EMA feeds into the Monetary EMA (IFAC, 2005). To buttress the two dimensions of Environmental Accounting, Sinding (1999) states that the environmental accounts may be expressed in two different ways which are environmentally differentiated accounting and ecological accounting. The former refers to monetary identification of costs in essence which is MEMA and the latter refers to the physical environmental costs described as PEMA in the EMA framework by Burritt *et al.*, (2002).

PEMA and MEMA are terms proposed to define EMA in general (Burritt *et al.*, 2002). Monetary Environmental Management Accounting (MEMA) deals with environmental aspects of corporate activities expressed in monetary units and generate information for internal management use. It is based on conventional management accounting practices (Alcouffe *et al.*, 2010; Burritt *et al.*, 2002) that have been adapted to include environmental aspects. MEMA is the central, ubiquitous tool which provides information for decision making by its ability to track, trace and treat costs and revenue incurred because of the company's environmental impact. MEMA acts as a control and accountability devise. On the other hand, PEMA acts as an information tool for decision making by internal management. PEMA focuses on the company's impact on the natural environment expressed in physical units such as kilograms and labour hours. PEMA tools are designed to collect unit physical environmental impact information for internal use and decision making by management (Schaltegger & Burritt, 2000 as quoted in Burritt *et al.*, 2002). Both PEMA and MEMA are internal environmental management systems which also feed the external reporting system. When this external reporting happens, PEMA and MEMA will be referred to as physical external environmental accounting and reporting (PEEA) and monetary external environmental accounting and reporting (MEEA). Figure 1.1 below illustrates the above explanation of internal vs external and monetary vs physical.

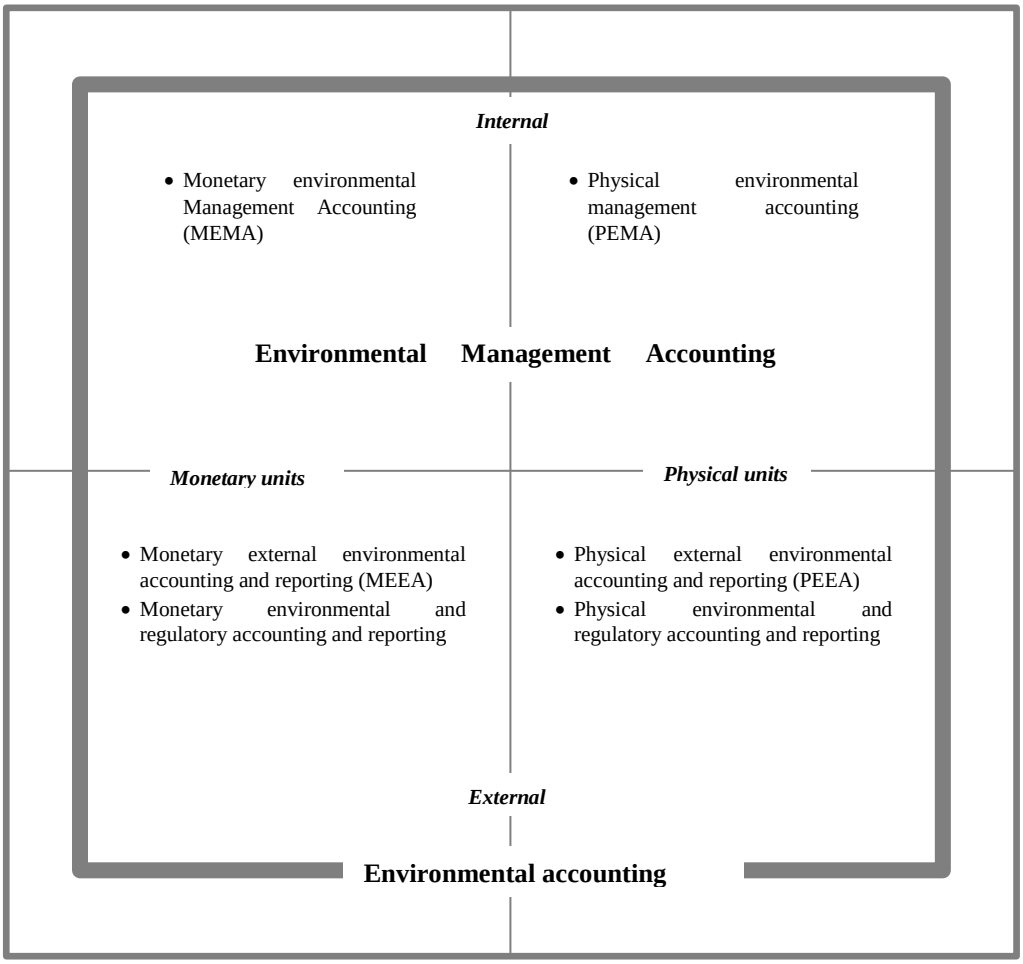

Figure 1.2 Environmental Accounting systems

Source: Burritt *et al.*, 2002

Traditional accounting brought the concept of EMA to light though traditional accounting or conventional accounting has been viewed as an inappropriate system to address aspects of Environmental Management Accounting. Traditional accounting takes environment related costs and benefits like any other operational costs and incomes in financial reporting. EMA promotes the appropriate allocation of environment related costs in order to take appropriate corrective action which ensures that decisions which are applicable to the environment are taken and implemented. With the coming in of EMA, the costs can be allocated directly to products, departments and processes rather than being lumped together as part of the production processes without specifics. The costs can be traced back to their causes. This promotes the taking of decisions that reduce environmental impacts. Previous research findings prove that the benefits of an EMA system (Kurniati *et al.*, 2010) outweigh the costs of implementing an EMA system even though the implementation requires substantial amounts of resources .

1.10.7. Promotion of sustainable development

There is limited research conducted on how EMA promotes sustainability. This argument is further supported by Christ & Burritt (2012), who suggest that, despite the increasing interest in EMA, theoretically informed projects concerning the current state of EMA remain scarce. This is another gap that this research tries to unlock. The focus of EMA by its own definition addresses the two pillars of sustainable development which are economic viability and environmental viability. The third pillar, social viability, is silent. With this knowledge that two of the three pillars of sustainability are addressed by the definition of EMA, there is a possibility that somehow EMA promotes sustainability. Social issues are believed to be inherent in environmental and economic issues. The moment the environmental and economic issues are addressed, it is assumed that the social issues will also have been addressed (Gray, 2010). Authors of sustainability and sustainable development agree that total sustainability is not achievable, but steps towards its achievement are very important (IFAC, 2005). If this notion is correct, then the omission of social elements in the EMA definitions cannot be taken as a reason for substantiating that EMA does not promote sustainable development. EMA indicates the sustainability of the mining sector and extractive industries. The questions that remain are how sustainable development is promoted by EMA or if it promotes sustainability at all. This study makes a contribution to fill this lacuna.

Through research it has been exposed that EMA promotes sustainable development by the establishment of a super fund to take care of environment-driven financial risks like, for example, liabilities associated with a need to clean up contaminated land. It has been estimated that American industries may be under-provided for `Superfund'-related clean up liabilities by up to a trillion dollars (Schoemaker and Schoemaker, 1995 as quoted in Bartolomeo *et al.*, 2000). The researcher noted that the initiatives of the superfund to cater for clean-up processes have not yet been established in Zimbabwe to take care of environmental liabilities created after the mining activities have been done. This is also true for South Africa which is struggling with acid mine water in Johannesburg which is caused by the reaction of underground water chemicals in areas where mineral resources were exploited about 120 years back. The rising acid mine water has the same acidity as vinegar or lemon juice and is a legacy of gold mining in the region. If the country had superfunds to cater for these environmental liabilities, corrective actions could have been taken to rehabilitate the degraded environment. With these two examples, it might be appropriate to extrapolate that most developing countries are not taking these superfund initiatives to take care of environmental liabilities. In developed countries like the USA, they are struggling with ensuring that the superfunds are not being under estimated to meet all the environmental liabilities.

1.10.8. EMA differences from traditional accounting

Traditional accounting or conventional accounting in this context means accounting that does not take into consideration environmental costs and benefits as a separate item from comprehensive and total income and expenditure of an organisation. The traditional accounting system consolidates revenue and expenses without distinguishing between those revenue and expenses that affect the environment or those revenue and expenses that do not have an impact on the environment. This distinction helps a company to know if the revenues being realised have an impact on the livelihood or ecosystem, that is, it is highly possible in the extractive industries to make profits out of creating more problems/costs which have a high environmental impact. For example, diamond mining in Zimbabwe is benefiting individuals (referred to as artisanal miners in Zimbabwe) but the mercury or products being used in diamond mining are causing a lot of environmental damage. Rivers are contaminated with mercury, human and animal life is being affected, and these costs can be quantified against the benefits.

EMA emphasises the sustainability of accounting practices in the sense that it is not accounting for achieving or checking whether an organisation is making a profit or loss (financial measure). It checks the environmental impact in financial terms, unlike the traditional accounting which checks the financial performance over a period of time. EMA checks compliance with regulatory frameworks and is very practical in nature, unlike window dressing traditional accounting which does not, somehow, ensure sustainability. The concept of EMA brought to life the issues of sustainability accounting.

Environmental Accounts follow traditional accounting procedures and style. They also include specifications or estimation of various types of liabilities and financial exposures arising from environmental impacts of products and processes. Though the procedures are the same, what they report is totally different. EMA reports on environmental impacts of products and processes while traditional accounting reports on the financial performance of a company over a period of time, that is, profit or loss at the end of the trading period. The environmental accounts may be separated into two different but related ways: environmentally differentiated accounting and ecological accounting (as quoted by Sinding, 1999 in Schaltegger, 1996). Ecological accounting uses physical impacts rather than monetary measures as the relevant basis for measurement to satisfy other stakeholders like regulatory agencies. The usefulness of environmental accounts is limited by their inability to handle external costs, although the ecological version provides a starting point towards measuring such costs (Sinding, 1999). The traditional accounting systems cannot measure the physical impacts of environmental related activities. The accounting systems reduce all things to financial terms, but does

not differentiate or give boundaries to what the system measures in accounting terms. EMA has the ability to track and analyse the flow of environmental information and reduce the flow in financial terms.

EMA brings about the issues of social accounting that broaden the scope of accounting from its traditional legally defined concentration on financial stakeholders to external stakeholders who are the society as a whole. The understanding of environment-related financial costs and benefits acts as an input to conventional management accounting. EMA systems strengthen the management accounting practices of the organisation because it brings out another angle of looking at environmental costs and benefits which was not present in traditional accounting systems.

Accountants and the accounting profession have much to contribute in EMA. Specifically, their experience is valuable in the generation, collection and analysis of data on resources consumed in processes. Much of the information will be in accounting records and systems. They help in the verification of data collection and analysis methods and the reporting and communication of quantitative data (Bartolomeo *et al.*, 2000). These contributions are the same in traditional accounting and in the EMA systems.

Alewine (2010) noted that traditional and existing accounting systems do not capture and display the required environmental accounting information for decision making purposes. Environmental Management Accounting is largely non-traditional and unfamiliar, hence, it addresses environmental measurements which are not found in traditional accounting systems. Closely linked to this is a notion by Burritt & Saka (2005) who give a fundamental environmental criticism that conventional management accounting fails to separately identify, classify, measure and report environmental information, especially environmental costs when providing relevant information to management for decision making, planning and control purposes.

1.10.9. Developing a framework for the implementation of EMA

The last objective of this research is to come up with a model framework for the implementation of EMA in Zimbabwe's extractive industries and mining sector. This framework will act as a blue print and/or skeleton for the adoption and implementation of EMA. The framework will be adopted by different companies with few alterations to meet the specific needs of the companies which fall under the extractive industries of Zimbabwe. This framework will enable companies to implement EMA with ease. Japan's Ministry of Environment developed EMA guidelines suitable for Japan and these guidelines are helping companies to achieve environmental efficiency with minimum efforts because there is a blue print and guideline to follow (IFAC, 2005). It is in this same vein that Zimbabwe will be better placed if they have a blue print or standard to follow. The framework does not prescribe the

possible environmental cost categories and revenue/benefits areas which are peculiar to Zimbabwe's extractive industry and mining sector. This helps companies to be flexible in coming up with their specific cost categories. The framework allows mining companies to explore their own internal and external environmental impacts and make informed strategic environmental decisions. Environmental benign decisions help companies to make profits and at the same time promote the minimisation of environmental impacts.

The frameworks which have been developed by Burritt *et al.*, (2000), IFAC (2005) and United Nations (2001a) are not specific to the mining sector. They mostly relate to the manufacturing sector. This shows the gap in literature regarding a framework that specifically relates to the mining sector. The mining sector has been reported to be a sector that is dynamic and different from organisation to organisation, hence the environmental impacts and benefits differ widely. These dynamics and differences in the mining sector led to the lack of an EMA implementation framework in the mining sector. It is the personal view and opinion of the researcher that the availability of an appropriate and robust framework in this sector will see many companies implementing EMA in their operations and developing initiatives which promote environmental efficiency thereby reducing environmental impacts and at the same time making profits by so doing.

1.11. Scope of the Research

This research was conducted in the mining sector and extractive industries of Zimbabwe. There are many sectors of the economy in Zimbabwe such as agriculture, manufacturing and healthy. These sectors are not included in this research. The research considered selected private and public mines. These include private owned government/public owned mines. These mines were be considered in this research because they fall under the mining sector and extractive industries of Zimbabwe.

A representative sample (through snowballing) of the whole mining sector companies was taken to represent the mining companies in Zimbabwe. The mining sector was chosen for this research because of the following three reasons:

1. Most of the research conducted in Environmental Management Accounting specialised in the manufacturing sector and agricultural sector, hence, to the knowledge of the writer, no substantial work has been done in the mining sector. IFAC developed a framework using the manufacturing sector and they acknowledged that the mining sector has not been looked at.
2. The mining sector is the economic backbone of Zimbabwe and one of the major revenue streams of the government. To study EMA in this sector will ensure extractive industries' and mining's sustainability for a long time into the future. The sector by its nature of being an

extractive industry is not sustainable, hence the need to develop systems that can possibly ensure sustainability and environmental efficiency.

3. The sector has been in the spotlight for several years from environmental pressure groups such as Zimbabwe Environmental Law Association, Pay What You Earn and Environmental Management Agency of Zimbabwe for not being accountable and transparent in reporting and disclosure of the contents of mining contracts, hence the study will help bring about transparency and accountability in the mining sector.

Environmental Management Accounting has been selected because it acts as a follow up to the recommendations of the Environmental Impacts Assessment. This is the vehicle that ensures that the agreements and recommendations of the EIA are conducted before the mining activities are operationalised. Sinding (1999) states that EIA is carried out for the purposes of obtaining the operating licence. Once the operating licence is obtained, all the recommendations of the EIA are never implemented or followed up to ensure that they are operationalised. EMA will work as a vehicle to ensure that strategic decisions which bring about sustainability in the mining sector are taken.

The regulatory framework in the mining sector is the Zimbabwean mining laws and regulations which safeguard the mining sector like the Mines and Minerals Act of 1961 and the Environmental Management Act together with other supporting mining policies like the Diamond Policy. The regulatory framework will not consider the policies under development like the Zimbabwe Mineral Policy document which has not been passed yet. Throughout the research, the researcher constantly tracked the developments in the regulatory framework in Zimbabwe and updated his work to remain current and relevant to Zimbabwe. Furthermore, the regulatory framework considers International Financial Reporting Standard (IFRS) 6: Exploration for and evaluation of Mineral Assets together with International Financial Reporting Interpretations Committee (IFRIC) 5: Rights to interests Arising from Decommissioning Restoration and Environmental Rehabilitation Funds, and other relevant IFRSs. These standards and interpretations are very important since the mining companies are audited for accountability to stakeholders (the government, shareholders and the affected general public) through compliance with the international standards. Companies may be given an unqualified audit report (a report that shows consistency with applicable International Standards and policies) audit report if they comply fully with the requirements of the standards as stipulated by the International Accounting boards, specifically, the International Financial Reporting Standards Board (IFRSB). These standards ensure harmonisation of accounting practices throughout the world in the extractive industries and mining sector.

The EMA framework which was used for the purpose of this research is the EMA framework proposed by Burritt *et al.,* (2002), IFAC (2005) and United Nations (2001a). These helped the researcher to develop the implementation framework for Zimbabwe. These frameworks have been selected because they are the legitimate frameworks which make up the foundation of Environmental Management Accounting. Throughout EMA literature, reference is given to any of the three frameworks. The International Federation of Accountants, IFAC (2005) developed the framework to be a starting ground for the implementation of EMA in different countries though the framework is generalised. The IFAC framework is closely related to the framework developed by Burritt *et al*., (2000) and United Nations (2001a). Using these three frameworks promotes the development of a comprehensive robust framework that takes into consideration the ideas and concerns given by all the three framework developers.

Case studies were consulted for the progress being made in developed countries like Australia, Japan and other developing countries which include South Africa. The purpose of consulting case studies in both developed countries and developing countries is to learn from their experiences and apply the experiences in developing countries. The whole idea is to easily produce an EMA system that can be applied in Zimbabwe and other developing countries after considering the differences in the operating and the regulatory environment. For example, environmental pressures are at a minimum in developing countries compared to developed countries.

The mining sector is a protected turf in Zimbabwe so obtaining information from the sector could be problematic. The research has relied mostly on primary data which was in the form of company reports and published financial statements. The researcher interviewed the accounting and operations personnel to understand, firstly, the dynamics of environmental accounting and reporting; secondly, the current phase of Environmental Management Accounting and the impact thereof on the mining sector; thirdly, the regulatory framework; fourthly, the importance of EMA in the mining sector; and finally, if EMA enhances sustainable extractive industry and mining development in the context of developing countries.

1.12. Research Process/Strategy

The overall research strategy for this study is shown in Figure 1.3 below. The research strategy encompasses a critical review of literature on EMA studies to identify gaps in the literature. This literature review enabled the researcher to outline the research problem and formulate research objectives which arise from the gaps pointed out in the literature. EMA facets are identified and scrutinised in reference to the mining sector.

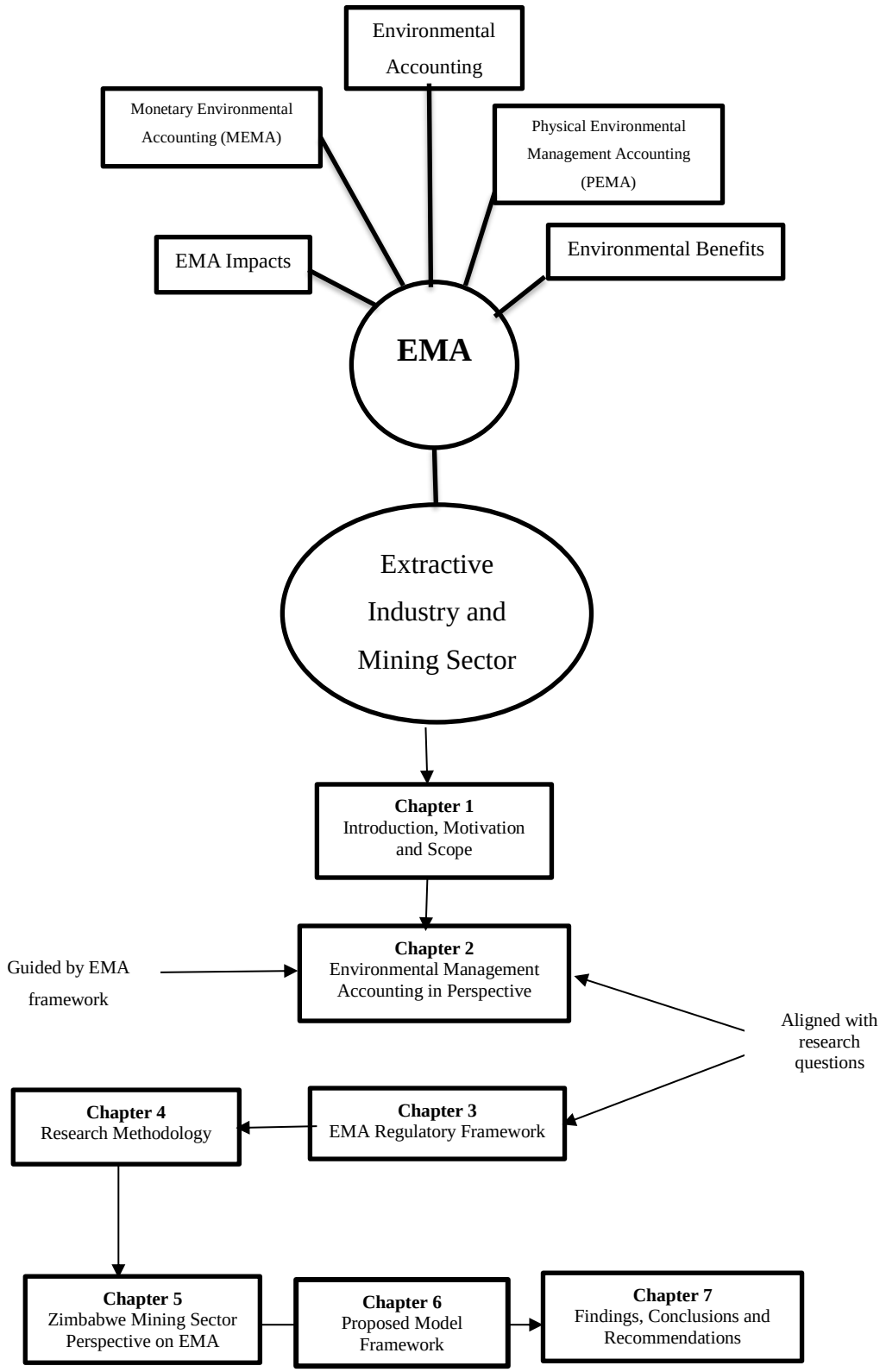

Figure 1.3 Research Process

Source: Author

1.13. Research Design and Methodology

This researcher present the alternative methods of achieving the research objectives and the rationale of the choices in line with research objectives. Research design refers to the many ways in which research can be conducted to answer the question being asked (Marczyk, DeMatteo & Festinger, 2005). A research design helps the researcher to obtain the right tools for answering the original research question in order to come up with solutions (Choga & Dumbu, 2013; Mitchell & Jolley, 2010). Kothari (2004) refers to research design as a conceptual structure through which research can be carried out. The research design gives the overall view of the methods chosen and the reasons for making such choices (Saunders, Lewis & Thornhill, 2009).

This study adopts a qualitative research design. Qualitative research involves studies that do not attempt to quantify their results through statistical analysis. Qualitative research typically involves interviews, case studies and observations without formal measurement. The essence of qualitative research is to identify the characteristics and structure of phenomena and events examined in their natural context (Jonker & Pennink, 2010). In this study, the researcher attempts to understand a specific organisational reality (EMA) and occurring phenomena from the perspective of those involved. The researcher is able to obtain perspectives and personal feelings from the participants. This research design enables the researcher to gain in-depth understanding of whether environmental cost management accounting is being implemented in the Zimbabwe mining sector or not and in what form. The research method allows the researcher to have an in-depth discussion of the current position in as far as implementation is concerned as well as the achievement of sustainable development. This design enables the researchers to understand the challenges and opportunities identified in the implementation process.

This study also used a descriptive survey design. A descriptive survey is concerned primarily with addressing the particular characteristics of a specific population of subjects, either at a fixed point in time or at varying times for comparative purposes (Gill & Johnson, 2002). In this study the implementation of EMA in the Zimbabwean mining sector and extractive industries was considered at a fixed point in time to check the current position and map the way forward in terms of the implementation plan.

1.13.1. Population

Kothari (2004) describes the population as all items under consideration in any research or field of inquiry. In this study, the population refers to all companies which fall under the mining sector and extractive industries of Zimbabwe. According to Kothari (2004), population may be broadly referred

to as ‘universe’. The research population provides all the information necessary for answering the original research questions (Gill & Johnson, 2002). The population consists of registered operating mines in Zimbabwe. The population consists of an up-to-date list of over 80 registered mining companies in Zimbabwe from the Unites States Department of Geological Survey (USGS) (Mobbs, 2015).

1.13.2. Selection of cases

There are many different sampling techniques or ways in which the sample group can be selected (Cassim, 2011). The sampling techniques include probability and non-probability methods. This researcher used the non-probability sampling method. The researcher did not know the chance or probability of any particular member of the population being selected in the sample. There was a high chance of including some members of the population in the research than others. The main types of non-probability sampling are quota, judgemental and snowball sampling (Tharenou, Donohue. & Cooper, 2007).

The researcher used the snowball sampling research design. He began by sampling a small number of mining companies who satisfy the inclusion criteria for the study. The researcher went on to ask these initial companies to identify other companies who meet the criteria. These subsequent respondents in turn identified others and so on (Creswell, 2012; Saunders *et al.*, 2009). The intent was that the initial small sample would ‘snowball’ into a larger one. This method was used because it is appropriate for this study which has a rare and inaccessible population. The ‘snowball’ approach help in determine when to stop gathering information or data.

Quota sampling was not used because the characteristics of the target population are not known and it would take much time to investigate them. Simple random sampling and systematic sampling, which are all examples of probability sampling, were not considered for the simple reason that they take time to execute since the selected companies might be difficult to reach. There was also a problem of lack of an up-to date list of all the extractive industries and mining sector companies in Zimbabwe. Stratified and cluster sampling were not selected because the characteristics of the population are not known which makes it difficult to define different strata and clusters of mining and extractive industry companies.

In the research methodology, the starting point for EMA could have been the list of Accounts (IFAC, 2005), which is the most common source of cost information within an organisation. Working with the list of accounts allows an assessment of site-wide or organisation-wide annual costs related to environmental issues. The chart of accounts was going to enable the researcher to understand the environmental categories within an organisation. The researcher was also going to understand the

inconsistencies in accounting systems by looking at the chart of accounts. This was not possible since companies were not willing to share the chart of accounts, citing a confidential clause.

In addition to the chart/list of accounts, the researcher accessed company financial records in the form of published financial statements and environmental reports to analyse the availability of environment related information (costs and revenues) and the nature of the reports which are produced in the mining companies. These reports are available in the public domain for viewing. The financial statements and environmental reports revealed the shortcomings in the reporting systems.

The researcher, after accessing companies' financial records, made appointments for interviews to clarify the shortcomings of financial reports. In these interviews, the researcher was guided by the 'snowball' sampling research design. The researcher requested the mining companies to refer him to other knowledgeable companies until the required information was obtained.

Case studies were consulted through literature in other countries in the mining sector, and these were used to shape the development of a model framework for Zimbabwe. Case studies give details of cost calculations which differ from case to case (see for example, Bebbington & Gray, 2001). The approach of this research aimed at describing and interpreting the process which ended in the construction of a model framework for the implementation of an Environmental Management Accounting system. Various case studies allowed the researcher to obtain very rich data and interpretations regarding the implementation of EMA. Case studies offer a low possibility of repetition and only a narrow and limited base for generalisation. However, case studies can provide rich descriptions, explorations and explanations of the phenomenon being studied, and are of particular use where few prior studies have been undertaken (Burritt & Saka, 2005). The case study approach was very suitable for this research since few prior studies have been done and rich informative data could be obtained. The researcher took case studies from Zimbabwe, South Africa and Australia among other countries. Case studies help in addressing multi-environmental accounting issues among other methods like archival, interviews and ethnography (Alewine, 2010). Case studies help a lot in exploring frameworks especially in this scenario where the researcher strived to develop an EMA model framework suitable for Zimbabwe and other developing countries.

Table 1.1 below summarises how the research questions were addressed in this proposed area of study:

Table 1.1: **Data collection methods as aligned to research questions**

Research question	Research method	Justification	Data collection method/instruments
How does Environmental Management Accounting promote sustainability?	Literature review/Content analysis	Literature review is essential to any study. It provides good understanding of the issues and debates in EMA and sustainability, current theoretical thinking and definitions, previous studies and results.	Journals, documents, environmental reports, interviews, case study analysis
Will EMA promote sustainability in the extractive industries and mining sector of Zimbabwe better than traditional accounting?	Literature review/Content analysis	The analysis of texts and documents is an unobtrusive (non-reactive) method, which means errors associated with the interaction between researchers and subjects are avoided.	Environmental reports, financial statements, observation, content analysis, snowballing, grounded theory approach, qualitative content analysis
How does the government of Zimbabwe currently regulate the mining companies?	Case study analysis/ Discourse analysis	High construct validity, in-depth insights; establishing rapport with research subjects, insider perspective, increased trust and credibility of research	Interviews, document analysis, structured interviews with regulatory authorities, consult different Acts, grounded theory approach
What is the significance of EMA in the mining sector and extractive industries?	Case study analysis, Literature review,	Involves participation of the subjects which is the mining sector, low refusal rates and ownership of findings	Document analysis, financial reports, semi structured interviews, analytical induction, grounded theory approach
How can Environmental Management Accounting be implemented in the extractive industry and mining sector?	Evaluation research: Implementation (process) evaluation	Aimed at assessing whether EMA has been well conceptualised and properly implemented. It is a	Observations of individual processes, financial data (financial reports, environmental reports), structured

		form of applied research	and semi structured interviews
What will be the model framework for EMA in Zimbabwe's mining sector?	Case study, literature review, implementation evaluation, model building studies or theory building studies, comparative studies	Good understanding of the actual environmental impacts, costs and benefits in Zimbabwe, theoretical insights, previous studies results and current debates in model development, building models helps in explaining phenomena in the world. A model is a set of statements that aims at representing phenomenon as accurately as possible in this case EMA in the extractive industries. Comparison of different theoretical viewpoints across different settings will be done.	Financial data of cost and benefits, texts, document analysis, observation, interviews, analogical reasoning, constructing a model of a phenomenon on the basis of its similarities to other phenomena.

Source: Author

1.14. Layout of Dissertation

The dissertation is divided into six chapters as follows:

Chapter one provides the general introduction to the research and the background of the problem to understand where the researcher is coming from. The history of EMA in Zimbabwe, which is at supranational level through the UNEP run programme, is given. The chapter discusses the significance of the study alongside the justification of the study as well as the research design and methodology which were used to address the research problem. The theoretical framework, scope of the study and the research process or strategy are also given.

Chapters two and three provide the literature review related to EMA in general. The review is closely aligned to the research question and research objectives in order to clearly articulate and address the research problem. This chapter contains the conceptualisation of the study and covers information on framework development. The chapter identifies and exposes the gaps in the current literature which this research tries to address.

Chapter four provides the research design and research methodology. This chapter will show how the study was undertaken to answer the research objectives or problems.

Data presentation, analysis and discussion is in chapter five. The researcher explores EMA in Zimbabwe by analysis data obtained from primary and secondary sources. The chapter includes the exposition of research findings. The chapter also deals with the evaluation of findings in general for the whole research. This section ties back the golden thread to the research question to have a golden circle.

Chapter six rolls out the proposed EMA model framework for Zimbabwe's extractive industries. The Chapter deals with the model framework development specific to Zimbabwe and also relates to literature discussed in chapters two and three. Chapter six also contains the evaluation of the proposed model, discussion and the implementation process.

Lastly, chapter seven concludes the whole research findings in line with the research questions and objectives. Major conclusions are spelt out. The study contributions and further area of research are given.

1.15. Definition of Terms

EMA – The management of the environment through the use of environment related accounting systems in order to enhance business performance by reducing environmental impacts in an economic and efficient way (United Nations 2001a).

PEMA – The use of non-monetary measure to manage the environmental impacts of business related activities (Burritt et al, 2002).

MEMA – The use of a monetary financial measures to manage environmental impacts of business activities (Alcouffe et al, 2010).

EA – Is a broad terms which points to environmental management in general (IFAC, 2005).

FCA – Encompasses the consideration of externalities in the management of environmental costs (United Nations, 2001a).

LCC – Life cycle costing is the measurement, recognition, tracking, recording and analysis of product/activity costs from the development of an idea/product to the disposal of the idea or product (Johes, 2010).

Extractive Industries and Mining Sector – Extractive industries have been defined (Australian Accounting Standards Board) as those which search for, and extract from the ground, natural substances such as minerals (including coal), oil and gas, sand, clay, stone, and salt; regenerative resources such as forests are not included (Cortese et al ., 2009)

Environmental Costs – These are environmental impacts measurable in monetary terms (IFAC, 2005)

1.16. Summary and Deductions

The purpose of the study is to assess the current and potential relevance of environmental management accounting for sustainability in Zimbabwe's extractive industries. The research purpose was addressed in line with five research objectives outlined in the chapter. The study is motivated by significant developments happening in the mining sector which requires the development and implementation of EMA systems. EMA ensures a win-win situation for both the mining companies and environmentalists. There is limited information about the implementation and impact of environmental management accounting in Zimbabwe's mining sector and extractive industries despite the sector being among the main contributors of negative environmental effects. The study is a case study of Zimbabwe's mining sector. The chapter provided the justification of the study and the need for developing a framework for EMA implementation in Zimbabwe's extractive industries. The background of the study discusses the need for EMA and the importance of implementing EMA in the mining sector of a developing country. The theoretical study of the research was laid out mainly based on the framework developed by IFAC (2005) and Burritt et al (2002). Literature review on EMA concepts was explained to provide an overall framework for the rest of the study and to give guidance on the parameters within which the study was conducted. Chapter two focuses on

environmental management accounting perspectives in order to situate or position the research in the context of this study.

CHAPTER 2
ENVIRONMENTAL MANAGEMENT ACCOUNTING IN PERSPECTIVE

2.0. Introduction

In this chapter, a literature review on Environmental Management Accounting is given. The chapter opens by discussing the concept of Environmental Management Accounting in its broad context. The chapter will discuss literature in line with this study's objectives as laid out in chapter one. The research gaps will be exposed and the research questions will be address. The literature review is broken into five major sections which are Environmental Management Accounting sustainability; regulation of the extractive industry and mining sector in Zimbabwe; the importance of Environmental Management Accounting in Zimbabwe; the implementation process; and the development of the proposed model framework in Environmental Management Accounting.

2.1. Sustainability in General

Sustainability can be defined in generic terms as the ability to exist in harmony with nature or for something to continue in existence for a foreseeable future with minimum effort from the systems developed. According to IFAC (2005) sustainability requires the recognition that humanity must live together within the confines of the limits of the environmental resources. IFAC (2005) further explains that sustainability is often portrayed as consisting of three facets which are social, economic and environmental. Sustainability in general is depicted as the ability to sustain, or support and from an environmental perspective as the quality of not being harmful to the environment or depleting natural resources, and thereby supporting long-term ecological balance. The latter definition is more appropriate in this research as it refers to the depleting of natural resources as this study looks at the mining sector which deals with natural resources.

Gray (2010a) explains sustainability as an environmental system based concept which makes sense at the eco-system level, difficult to conceptualise at anything below the planet and species levels. The author states that because of the complexities in sustainability, whatever organisations account as sustainability might not be accounts of sustainability. Gray (2010a) poses a question, what is this sustainability that we wish to account for? In addition to that, he posits that sustainability has a troubled relationship with modernity, which means that in much of the developed world it is difficult to find sustainability. It is rather a rhetoric term with no structural support. This can be true for developing countries which are trying to bring modernity (which is contrary to sustainability) to their door steps.

It is increasingly evident in literature that sustainability has become more synonymous with other notions like social responsibility or environmental management or sustainable development. This notion needs to be corrected by clearly indicating what is meant by sustainability.

The notion of sustainability in business is said to be contestable since it is very difficult for businesses to continue for a foreseeable future. Businesses survive because the stakeholders allow the business to continue in operation. Sustainability issues place the responsibility of the existence of organisations or companies on the very same companies. These companies, by virtue of the way sustainability is portrayed, are viewed as being so responsible. Sustainability in business is seen as doing responsible activities, which is a misleading appropriation of the term 'sustainability'.

Sustainability can be demonstrated after an organisation manages to survive over time in harmony with fauna and flora. Literature is increasingly evident of this notion that it is very difficult to demonstrate sustainability's starting point and end point. There are many difficulties in measuring the sustainability of companies while they are in operation, but retrospective reflection of how the company was sailing through can be done and the information used in companies which are in their start up or development phase of their life. Phillis & Andriantiatsaholiniaina (2001) state that sustainability is difficult to define or measure because it is complex in nature.

2.1.1. Sustainable development

The most famous definition of sustainability comes from the Brundtland definition of 1987 "Our common future" which states that it is development that meets the needs of the present without compromising the ability of the future generations to meet their own needs (WCDE, 1987). The concept of sustainability brought about issues to do with sustainable development. This development was conceived in an environment whereby countries were trying to encourage developments which are not harmful to the natural ecosystem and which are in harmony with nature.

Through the eyes of sustainable development the United Nations Division for Sustainable Development (UNDSD) saw it fit to come up with a working group called the United Nations Expert Working Group on Environmental Management Accounting (United Nations, 2001b). This working group's agenda was to encourage countries at national, supranational or regional level to adopt the concept of Environmental Management Accounting as a way to spearhead the SD agenda in the world. Many countries all over the world are part of this expert working group. The whole idea is to promote sustainable development. With this in mind it is proper to logically suggest that Environmental Management Accounting promotes sustainable development.

The expert working group consists of members who represent 30 countries. The members came to a consensus of defining Environmental Management Accounting as the identification, collection, analysis, and use of two types of information (physical environmental information and monetary environmental information) for internal decision making (Jasch, 2006b).

SD has been understood to consist of three pillars which are the social pillar, environmental pillar and the economic pillar (IFAC, 2005). The EMA's definition generally accounts for the environmental pillar but if you go deeper in the definition it now deals with both the environmental pillar and the economic pillar but excludes the social pillar which, according to various scholars, is believed to be inherent in the definition itself (IFAC, 2005). The broad arm of the environmental pillar has been extended to deal with Environmental Management Accounting or environmental accounting as it is generally used interchangeably.

The sustainability concept and sustainable development together brought about the issues of sustainability accounting research and practice. Sustainability accounting does not include only the environmental and economic pillars but also the social issues which are essential to overall sustainability. It is on record that most EMA initiatives do not include social issues (IFAC, 2005). Social and environmental accounting is a brain child of sustainable development. Thus EMA is a tool brought about to enhance sustainable development.

2.1.2. The three pillars

The three pillars of sustainable development (IFAC, 2005) are often referred to as the triple bottom line (TBL) of sustainable development (SD) or the three dimension of sustainable development (Elkington, 1999; Lamberton, 2005). This form of sustainability aims to report on the organisation's economic, social and environmental impacts. The TBL focuses on monetary measurement of economic, social and environmental performance of an organisation to indicate how sustainable an organisation is. The Global Reporting Initiative (GRI) sustainability accounting guidelines utilise a wide array of tools to measure performance towards the sustainability goal.

Ambe (2007:59) defines Environmental Management Accounting as consisting of the three pillars and states that "Environmental Management Accounting is a tool used for balancing the interaction between the economic, social and technological factors in the development process to achieve conditions for sustainable development". This emphasises the importance of the three pillars of sustainable development in Environmental Management Accounting and in a subtle way pointing out that the whole idea of EMA is to promote sustainable development. EMA is used as a tool to promote sustainable development.

Bennett, Bouma & Wolters (2004a) point out that EMA inherently encompasses the environmental and economic aspects of sustainability. The challenge is to bring the social aspects of sustainability within the remit of EMA. This is because there is no consensus on what is represented by good corporate social performance. The measurement of the social aspect will be another challenge which sustainability management accounting is trying to deal with (Bennett. *et al.*, 2004a).

The King IV codes of corporate governance of South Africa endeavours to bring the three pillars of sustainability together in a way that creates value for organisations, investors and communities in a manner that sustainability is achieved in different sectors of the economy. Chief among the issues spelt out in the King IV codes is the combined context of the economy, society and economy in which the organisations operate, which is the same emphasis of environmental management accounting. King IV requires companies to apply all principles as opposed to the requirements of the King III report (KING IV, 2016). In the case of environmental management accounting, companies will be required to apply the concept and then explain it, which is more proactive rather than explaining a concept that is not being applied. The report goes further to discredit the rules based approach to systems and goes for the principles and outcomes based approach to issues to do with sustainability. The key focus is also on transparency and targeted disclosures. The issue of transparency and disclosures is very important in EMA, which makes the King IV report a good document to consider in EMA implementation. The roles and responsibilities of stakeholders are considered and are important in the report. The disclosures mentioned above also ensure that the role of different stakeholders are taken care of in as far as environmental reporting disclosures are concerned (KING IV, 2016).

2.1.3. Sustainability accounting and social accounting

Research linking accounting to sustainability began in the early 1990s (Dumay *et al.*, 2016; Lamberton, 2005; Parker, 2011; Schaltegger & Zvezdov, 2015; Schaltegger, Gibassier & Zvezdov, 2013). Lamberton (2005) devised a sustainability accounting framework which pointed out that EA is an evolved form of sustainability accounting. This means that before we had environmental accounting we first had sustainability accounting. This concept was being developed until the conception of environmental accounting and later Environmental Management Accounting.

It is interesting to note that the world summit on sustainable development was held in South Africa, Johannesburg, in August 2002 (Ambe, 2007). In this summit, the sustainability reporting guidelines helped in bringing various approaches together in order to come up with a sustainability accounting framework. This indicates that South Africa is at the core of sustainability accounting and spearheading its development in Africa. Schaltegger *et al.*, (2017) indicated that the various

approaches in sustainability are not enough. Sustainability accounting should have a more overarching purposes, such as how organisations respond and contribute to global economic and social activities to stay in safe boundaries of the planet as exposed by the UN Sustainable Development Goals (SDGs) (United Nations, 2001b).

The sustainability accounting framework draws on the traditional financial accounting model (Deegan, 2013; Lamberton, 2005; Lodhia & Hess, 2014) where management accounting involves the internal organisational practices and financial accounting is concerned with external organisational practices giving the financial performance of an organisation. Sustainability accounting and reporting, just like traditional accounting, includes an internal component which requires management of sustainability issues (sustainability management) and an external reporting element (sustainability reporting).

The sustainability accounting framework developed by Lamberton (2005) identifies three different methods of sustainability accounting drawn from the traditional financial accounting model. The three methods are sustainable cost, natural capital inventory accounting, and input-output analysis. Sustainable cost had been defined as the cost of restoring the earth to its natural position before the company activities which affect the environment were done. Gray (1992) further explains sustainable cost as the amount of money an organisation would have to spend at the end of an accounting period to restore the natural environment to its position before the start of the accounting period. This sustainable cost is usually deducted from net profit derived using the international financial reporting standards (IFRS) and international accounting standards (IAS) at the end of the period to remain with sustainable profit or loss at the end of the period. This calculation derived from traditional accounting model is illustrated in Table 2.1 Sustainable profit/loss illustration below

Table 2.1 Sustainable profit/loss illustration

Net Profit (IFRS)	XXXX
Less: Sustainable cost	(XXX)
Sustainable profit/(loss)	**XXXXX**

Source: Author

Sustainability accounting was defined by Burritt & Schaltegger (2010:829) as “a set of tools that provide help for managers dealing with different decisions”. The authors went on to say sustainability accounting is seen as representing the process for information collection and communication to support internal decision making to implement corporate sustainability. There is need for cost and benefits of social and environmental matters to be identified, measured and quantified in sustainability accounting.

Lodhia & Hess (2014) state that sustainability accounting and reporting is the organisational response to the management and reporting of its social and environmental issues. The sustainability concept has risen to prominence recently due to the increasing emphasis on sustainability (social and environmental) issues in modern day globalised society (Lodhia & Hess, 2014). Sustainability accounting and social accounting are two sides of the same coin. There is no way an organisation will mention sustainability accounting without involving social issues.

Theories have been postulated to explain sustainability accounting and reporting; among these are legitimacy theory, stakeholder theory and institutional sociology theory. Legitimacy theory states that for institutions to survive they need to legitimatize their existence to society and sustainability accounting is one tool to do that. Stakeholder theory states that organisations should be able to manage all its stakeholders in order to legitimise its existence and the new institutional sociology states that different forces from institutions and society forces organisations to adopt sustainability accounting. These forces might be regulatory, pressure groups or industry practices (Qian, Burritt & Chen, 2015).

In other accounting circles sustainability accounting has been termed 'social and environmental accounting'. This term indicates the integration of social issues together with environmental responsibility. Sustainability accounting and reporting practices are evolving but progress is slow (Ambe, 2007; Kumah, 2006). Sustainability accounting is an indication towards sustainable Environmental Management Accounting. EMA has been considered to be synonymous with sustainability accounting.

2.1.4. Sustainable Environmental Management Accounting

Environmental Management Accounting is a sustainable development initiative brought by the UNDSD. The concept which is in its adulthood stage is a pointer towards sustainability. EMA in itself is a sustainability initiative. It ensures that accounting systems which are responsive to the environmental impacts are developed and incorporated in the day to day running of business activities as illustrated by the United Nations (2001a) definition which this research has adopted.

Sustainable Environmental Management Accounting encourages the development of systems which are beyond the traditional way of doing business. These systems should display information useful for decision making, at the same time addressing social, environmental and economic issues. The systems should in most cases take into consideration the natural capital state at the beginning of the processing and at the end of the process then try to estimate the cost caused by the economic activities of a company (sustainable cost). These costs help companies to know with certainty the amount of damage being exerted on the natural earth and estimate the actual profits companies will be making. Gray (1992) simplified the sustainable costs into what he called 'sustainable cost calculation (SCC)'.

SCC is an account of sustainability which measure the additional costs borne by the organisation if the organisation's activities were not to leave the planet worse off at the end of a reporting period (Bebbington & Gray, 2001).

The natural capital under Environmental Management Accounting is part of the conventional accounting principles of capital maintenance (Lamberton, 2005). All systems that deplete the natural environment by their nature are never sustainable. The only way the descendants of the world will be able to account for sustainability is to check the amount of unsustainability in our activities and try to reduce it. Thereby companies somehow will be accounting for their unsustainability in order to come up with decisions which reduces the unsustainable activities.

Sustainable EMA should be able to stand the test of time and prove beyond any reasonable doubt that the system is able to address environmental issues in monetary terms. The concept should not be one of those tools which appear to be good if companies implement them, but it should offer a solution to solve environmental problems for both the present and future generations. EMA systems should be capable of being adopted by companies in different industries with ease in order to measure whether they are sustainable or not. The EMA frameworks developed should be comprehensive enough to give flexibility to the implementers. Governments should be seen to spearhead EMA initiatives as per UN DSD's vision.

Environmental impacts (costs and benefits) are easily understood in monetary terms rather than physical terms. The monetary aspects may foretell the disasters which might befall industry, community and environment before they happen and corrective actions may be taken to address the environmental impacts. The stakeholders in any venture which has high environmental impacts should have enough information in order for them to know how business activities might affect them immediately or in the near future. Once stakeholders are enlightened by the EMA system, the system can be considered to be a sustainable system. The researcher seeks to understand from those companies implementing EMA whether the systems are able to give enough feedback to the interested parties and in what form the feedback is being given. This enables the researcher to test whether EMA initiatives are being sustainable or not.

The major thrust of this research is to look at the relevance of EMA in the mining sector. The researcher seeks to understand whether EMA initiatives by various companies in Zimbabwe enhance sustainability in the sector. The next section will look at the sustainability context of the extractive industry and mining sector from a broader perspective and narrow it down to Zimbabwe.

2.1.5. Sustainability in the extractive industry and mining sector

Literature is awash with the views that the extractive industry and mining sector by their nature are a weak form of sustainability (Ambe, 2007; Dhliwayo, 2014; Murombo, 2013; Sinding, 1999). This is not only stated in literature but also physical observation points to the same notion when you look at the degraded land caused by the extractive activities, acid water gullies, and irreparable and damaged ecosystem. All this demonstrates the harmful nature of the industry to the ecosystem and the environment at large. Having observed this physically, can we say with certainty that sustainability is not possible in the mining sector? Shall humanity give up on developing initiatives which reduce environmental impacts? The mere fact of trying to reduce environmental impacts indicates the sustainable initiatives. This current study posits the idea that sustainability of the extractive industry and mining sector should be viewed from another point of view, not the ordinary theories of sustainability as we know them from previous literature.

Sustainability in the mining sector does not mean total eradication of unsustainable extraction but small steps which will be made toward reducing environmental impacts. Be it development of robust environmental accounting systems or development of waste management systems, these small steps may bring sustainability in the sector. Gray (2010b) posits that it is impossible to achieve total sustainability but small steps towards its achievement are commendable and can be equated to a process in the right direction, which is achieving sustainability.

Sustainability in the mining sector, according to Murombo (2013), mean that companies in the sector are working in good faith with the local communities to make mining contribute to social, economic and environmental issues e. This can be in the form of infrastructure development (development of schools through building schools, roads, maintaining the landscape) and entering into partnerships with local community trusts to leave a legacy of wealth. Though it remain to be seen whether the local community trust will benefit the future generations.

The mere development of mining regulations can promote sustainability in the mining sector. This is evident in South Africa with the development of the Minerals and Petroleum Resources Development (MPRD) Act in 2002. This piece of law promotes sustainable mining and black economic empowerment. The South African government as well as the Zimbabwean government aim to make mining sustainable by introducing environmental laws in the sector. These laws were ineffective because they were faced by environmental resistance and poor enforcement thus remaining at the peripherals of sustainability in the sector (Murombo, 2013). The regulatory framework within which the extractive industry is operating in, needs a complete overhaul if the mining sector is to be sustainable. Compliance to environmental regulations means the adoption of EMA systems as

Sinding (1999) indicated that for firms to demonstrate that compliance has been achieved they have to engage in some form of environmental accounting which is EMA.

The extractive industry is well documented for its environmental unsustainable activities (Mtisi. *et al*., 2011; Sinding, 1999). Lodhia & Hess (2014) indicate that the concept of sustainable mining being adopted by the mining industry is a fallacy; the actual practices (in the name of sustainable mining) are the same as the past practices. Questions still remain whether mining will anchor sustainable development in Africa (Murombo, 2013). Other world views are of the opinion that it could be possible to make mining sustainable. The question is how could it be possible to make mining sustainable? This study aimed to fill the knowledge gap and try to find the relationship between EMA and sustainability in the extractive industry and mining sector which brings us to the next section which will look at the link between EMA and sustainability in the extractive industry.

2.1.6. The link: EMA and sustainability in the extractive industry of Zimbabwe

The mining industry requires effective sustainability accounting and reporting to transition to sustainability (Lodhia & Hess, 2014). Companies need to give evidence of their social and environmental responsibility to their stakeholders and sustainability accounting and reporting is an approach that has been utilised by them.

EMA is one way of enhancing sustainability in the sector other than the traditional well known ways of ensuring sustainability by focusing on developing a water tight regulatory framework. This is not to say the regulatory framework is not necessary. EMA will work as part and parcel of enforcing the regulatory system not only as a punitive measure but also as a beneficial means to the implementing parties.

EMA is a vehicle towards sustainability. This system ensures that sustainability of the extractive industry is put to practice on a day to day basis. The extractive industry and mining sector is one sector that has high environmental impacts which need immediate attention in the implementation of techniques that ensure reduction of environmental impacts.

The extractive industry of Zimbabwe has not yet been fully developed to properly recognise the link between EMA and sustainability. Sinding (1999) is well known for stating that the mining industry requires effective sustainability accounting and reporting in order to transition to sustainability. A few studies (see for example, Schaltegger et al, 2008; Mohr-Swart, 2008) have been conducted to try and establish the relationship between EMA and sustainability in the mining sector. This study is an addition to the board of knowledge by establishing whether there is a relationship between EMA and sustainability in the extractive industry specific to Zimbabwe. This lead us to the next section which

looks at how specifically EMA promotes sustainability. The researcher will look at empirical evidence and theoretical evidence to understand the phenomenon.

2.1.7. EMA in promotion of sustainability

Environmental Management Accounting has been portrayed as a tool which promotes sustainability. This section will look at how EMA promotes sustainability, if it does promote sustainability based on empirical and theoretical evidence. EMA was conceptualised as promoting sustainable development in different countries. The promoters of sustainable development saw EMA as an avenue for promoting sustainability, though there is little evidence in literature which specifically states that EMA promotes sustainability.

Sustainability accounting is evolving slowly in the mining sector (Lodhia & Hess, 2014). Developing countries are slowly adopting EMA initiatives and sustainability issues at large (Hilson & Murck, 2000) This is an indication that EMA is progressing slowly in its promotion of sustainability especially in developing countries.

EMA and sustainability accounting terms are often used interchangeably. What they promote is the same. They promote the development of environmentally conscious systems which aim at promoting sustainability through the reduction of environmental impacts. Sustainability accounting has been viewed as an avenue of recording environmental impacts in physical and monetary units. The recording of environmental impacts enables the measurement of sustainability.

In order to explicitly consider whether EMA promote sustainability there is need to understand the multidimensional definition of sustainability which considers the ecological aspect, social aspect and the long term economic aspect of sustainability. There is also need to reflect on the objectives of sustainability and sustainable development. These considerations enable companies or individuals at macro and micro level to comprehend whether EMA promotes sustainable development.

Accounting principles come to play when you consider how EMA promotes sustainable development (Gray, 2013; Schaltegger *at al*., 2013). The concept of materiality and precautionary principle need to be considered and it should be understood that only those aspects with high environmental impacts and high risk should be considered first (Burritt & Schaltegger, 2010). This does not mean the total exclusion of items with low environmental impacts. The low environmental impacts should be recorded and communicated to the internal and external stakeholders.

EMA draws its definition from the three dimensional definition of sustainable development. This three dimensional definition has its performance indicators defined by the global reporting initiative (GRI) guidelines. These indicators range from financial to non-financial indicators. The economic

indicators can be reduced to financial indicators but the social and ecological indicators are difficult to reduce to quantitative information and this led to the development of sustainability reporting narratives which are sometimes manipulated by organisations to represent what they want the stakeholders to believe about sustainability (Lamberton, 2005).

EMA is a vehicle and tool developed to further the sustainability concept by the UNDSD but there remains a question in scholars and implementing governments and companies whether the tool developed will be able to promote sustainability. It is not yet clear and to be seen by scholars whether EMA promotes sustainability. It is evident from literature that EMA was development as a way of promoting EMA from an accounting dimension *(*Burritt *et al.*, 2002; Gray, 2010b; IFAC, 2005; Lamberton, 2005). This has not been put to test to check how or if it promotes sustainability or supported by practical sustainability accounting research (Gray, 2010b)

The chosen definition of sustainability shapes the direction of sustainability accounting within an organisation and helps to investigate whether EMA promotes sustainable development. The major objective of sustainability accounting according to Lamberton (2000) is to measure performance towards sustainability. This raises the question as to whether sustainability is a relevant objective at organisational level. The question prompts the researcher's mind to look at the sustainable definition of sustainability which directs the direction of sustainability accounting.

Global Reporting Initiative (GRI) uses a wide array of tools to measure performance towards sustainability goals, unlike the TBL proposed by Elkington (1999) which tries to utilise monetary performance measures only. The GRI sustainability indicators show that there is a possibility that EMA promotes sustainability by the development of a wide range of performance indicators towards the sustainability goal.

2.1.8. Sustainability of EMA in an African context

Sustainable EMA refers to a system that is able to address the requirements for which it was put in place in the initial phase and as speculated and defined by the UN DSD. It is evident in literature that EMA initiatives in Africa are progressing but at a slow rate (Ambe, 2007; Jamil *et al.*, 2015). The International Federation of Accountants is on record saying that EMA in the extractive industry is progressing slowly because of the lack of specific guidelines in the industry and also the uniqueness of the industry to embrace EMA initiatives (IFAC, 2005).

It is not clear whether EMA systems in the extractive industry in Africa are sustainable in the sense that they enhance the promotion of environmental protection, thereby reducing the environmental impacts and at the same time helping managers of the industry to make environmental sound

decisions. The adoption of EMA in Africa is moving slowly with South Africa possibly leading the adoption of EMA (Ambe, 2007). This is evident in the first world conference on sustainability accounting which was held in Johannesburg, South Africa in 2001. In this conference the first guidelines were developed, which are used internationally.

The adoption of EMA is progressing slowly in Africa and the developing world because EMA systems are expensive to develop and run in the sense that this system requires a substantial amount of money to implement it (IFAC, 2005). However, Deegan (2003) as quoted in Qian *et al.*, (2015) argues that a more comprehensive consideration of EMA information is neither expensive nor difficult to implement if it is based on existing costing systems. Jasch (2006b) sums up the whole argument by showing how easy it is to do an environmental assessment in one day. The other reason is the lack of regulatory environment that enforces the implementation of the systems; the operating environment is not well regulated to require the systems. Developed countries take advantage of the lack of these regulations to exploit Africa mineral resources, and the operating environment makes it easy for the developed countries to do business and make more profits. There are no pressure groups which seriously lobby for the adoption of systems which enhance accountability of business operators to the general public. The lack of expertise in EMA is another limitation in Africa to implement EMA initiatives. Governments on the other side are not well equipped to run these EMA initiatives though UNDSD has been promoting the implementation of EMA at supranational and national level.

2.1.8.1. Sustainability in Africa compared to the world

Discussions about EMA are limited to western industrialised nations (Qian *et al.*, 2015). The developing countries have not been brought to the discussions of EMA (Qian *et al.*, 2015). This is against the back ground that the developing countries especially in Africa are the ones with high volumes of mineral resources which are being exploited by the developed world for their survival. The high economic growth has brought unprecedented environmental degradation (Qian *et al*., 2015) as well as high environmental liabilities to operating companies. Zimbabwe has not been left out in this high mineral resources extraction boom in order to feed the developing countries at the expense of the natural environment on which animals and humans depend.

The United States of America is leading research in EMA. This is shown by the amount of research output of USA in comparison to other countries as shown on Figure 2.1 below

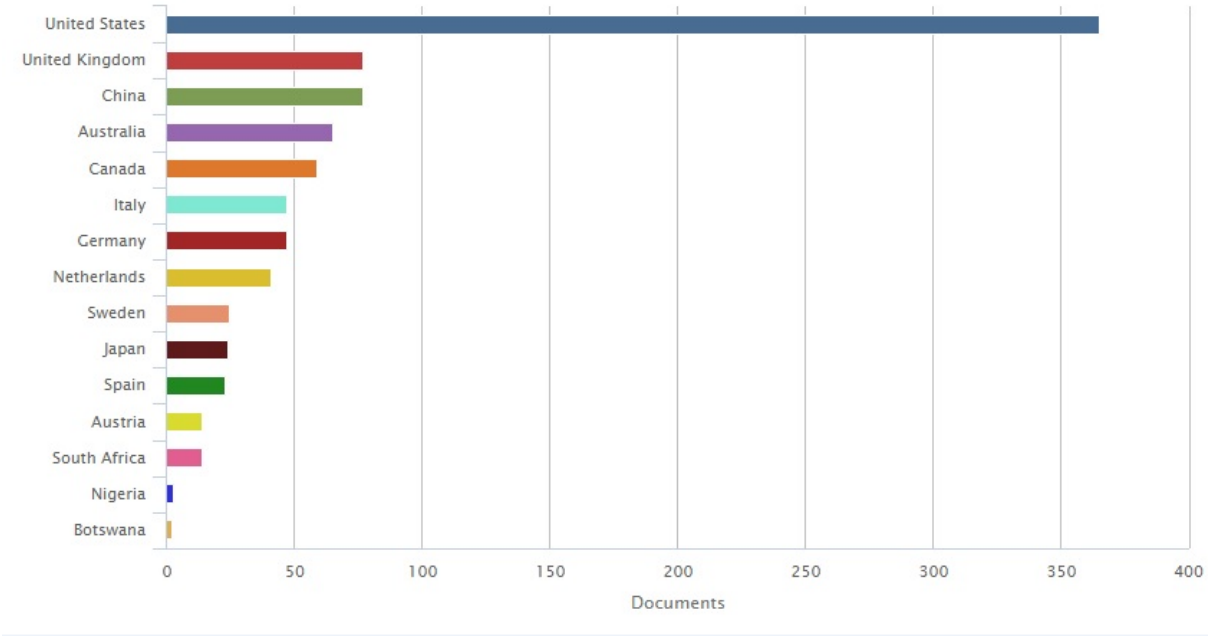

Figure 2.1 Research output in EMA[1]

Source: Scopus Database (2015)

Countries in the world are way behind USA in as far as EMA research and implementation are concerned (United Nations, 2001a). Africa and the developing countries in general are following behind with research output coming from South Africa, Nigeria and Botswana. In as far as EMA research is concerned, Zimbabwe is not in the picture. This clearly indicates how Zimbabwe is left behind as well as Africa as a continent in the implementation of EMA. The volume of research in a country somehow indicates the awareness of the subject matter and ultimately the strides being done on the ground to ensure the implementation of EMA.

The US Environmental Protection Agency (USEPA) Office of Pollution Prevention and Toxics has published reports on EMA in the oil/gas sector and the metal finishing sector (United Nations, 2001a). These reports are useful in light of producing sector specific guidelines which are not generic. Sector specific guidelines are important in making EMA sustainable in any industry because industry sectors

[1] Scopus data base was used to come up with Figure 2.1 and Figure 2.2. Scopus is primarily a bibliographic database. It provides references to publications. It is also a citation index which means that it does not only contain publications but also the publications that referenced those documents. Figure 2.1 Research output on EMA information was obtained by using the 'Analyse search results' function of Scopus. The search was limited to countries which have published EMA research in the past and the number of documents produced since the 1990's.

The analyse function was limited to the number of EMA documents published per year to come up with figure 2.2. The tables were extracted directly from Scopus after the search results were limited to number of documents produced (Figure 2.2) and the countries (figure 2.1) which were produced EMA research output.

have different types of material flows and are subject to different types of environmental impacts (United Nations, 2001a). The USEPA is pioneering a great part of work in EMA implementation in the extractive industry.

The extractive industries around the world (for example, The Nippon Oil group in Japan) implemented environmental accounting as a general tool for information disclosure and business management to ascertain the efficiency and effectiveness of environmental management (Burritt & Saka, 2005). The implementation of EA does not really show how sustainable the system is in the extractive industry.

2.1.8.2. Cases in Africa

Africa has the potential to supply the world market with minerals from chrome, diamonds, gold and many other mineral resources (Murombo, 2013; The Telescope, 2015). This comes as an indication that massive resource extractions are being done in Africa. There is, therefore, a need to consider environmental impacts due to high resource extraction. It is reported that most of the companies operating in the mineral industry of Africa have their parent companies in developed worlds (Jaskula, 2013; Mobbs, 2012, 2014). These companies take advantage of the relaxed operating environment in Africa (Kumah, 2006).

Sustainability of EMA in the extractive industries of Africa is being promoted at supranational level. Most governments are not concerned about the sustainability of the extractive industry. Sustainability in the extractive industry has been defined as an industry that is able to contribute significantly to the fiscal and welfare of the general populace despite the impacts on the environment and the surrounding communities. The adoption of this system is usually seen as an unnecessary massive expenditure which cannot be funded by the poor countries. The governments would rather channel their effort to ensure that resources are transparently accounted for rather than ensuring the availability of the systems which ensure accountability both ways, to the governments, environment and the general populace. This research is concerned with finding out the impact of EMA systems in Zimbabwe's extractive industries and learning from developed and developing countries.

Murombo (2013) directly points out that African countries are suffering from the "curse of poor laws and policies". The developing countries are failing to benefit from their mineral resources because of these weak environmental laws and policies (Kumah, 2006; Sinding, 1999). These poor regulations undermine the sustainable development goals like the environmental sustainability goal which in this study is narrowed down to Environmental Management Accounting. However, Kumah (2006) argues that performing in line with regulations does not necessarily translate into sound environmental practice. It is not clear whether mining will anchor sustainable development in Africa (Murombo,

2013) although literature reveals that it could be possible to make mining sustainable. The regulatory framework surrounding the extractive industry will be dealt with in detail in the next sections.

Environmental disclosures are increasing in Africa (Alewine, 2010). Environmental disclosures are clearly linked to Environmental Management Accounting and it takes the reporting element of EMA. Using fuzzy logic (Phillis & Andriantiatsaholiniaina, 2001) if environmental disclosures are increasing it might somehow be possible that environmental reporting is increasing but environmental disclosures do not necessarily indicate that EMA is being implemented or practised. The disclosures might come as a regulatory requirement of the companies' Act as well as the guiding financial reporting standards. The disclosures might also come as part of companies' social responsibility. In this regard it is very important to check what the disclosures relate to. Alewine (2010) indicates that environmental disclosures decreased around the year 2000 for specific and general environmental disclosures. The decrease in these disclosures can show the direction which sustainability is taking. It is logical to reason that importance is not being placed on environmental disclosures.

2.1.9. Unsustainable businesses

Unsustainable business may be thought of as negative consequences or unintended results of economic activities of production on the socio-economic environment. These negative environmental, economic and social impacts are never the expectations of many businesses but on the process of trying to make profitable businesses the negative environmental impacts are inevitable especially in the mining sector. Some of the impacts or unsustainable ways of doing business end up as being the normative part of doing business with indicators which enable businesses not to exceed expected levels of environmental damage. There is an acceptable level of unsustainability in business which seem to be agreed by industry operators for survival of human kind as well as business. This is being unsustainable in a sustainable manner because the system compensates consciously and deliberately for the damages to the environment (Gray, 2010b). The mutual agreement regarding environmental damage as collateral which cannot be avoided and is beneficial to the implementers of the processes should be scrutinised under a microscope of building sustainable businesses. There is a level of environmental sacrifice that should go with some business practices and this level can be paid off in the form of fines or in one way or the other. The concern is: does the environmental sacrifice (unsustainable business) commensurate with the benefits obtained by the economic activities being done? Are the penalties enough to guarantee businesses' continuation of the exploitation of natural resources? A compromise has to be reached in the form of standard environmental damages acceptable to the regulatory boards in different jurisdictions.

Conventional accounting has been found to be a culprit in the promotion of unsustainable business by its nature (Gray, 2013). Accounting promotes unsustainable business through its financial capitalism drive (Gray, 2013) which is the need to make profits at all costs. This can be argued that accounting is just an accountability tool with no intended biased results (the system is on check through auditing). Accounting systems encourage the recording of business profits and encourage its managers to concentrate in making profits regardless of the means by which the profits will be made (Gray, 2013). The coming in of EA changes the focus from profit focus to environmental focus which is sustainable to some extent.

Specifically to this research, literature reveals that the extraction of mineral resources is unsustainable (see for example, Bloch & Owusu., 2012; Garvin *et al.*, 2009; Luther, 199); Tarras-wahlberg, Flachier, Fredriksson, Lane, Lundber & Sangfors., 2000). Mining activities can physically damage the environment, reduce arable land, pollute water and air, and disrupt livelihoods to local communities (Gray, 2010b; Murombo, 2013). Damage to the environment is the same as damage to critical natural capital which can be valued at infinite cost which is irreplaceable (Lamberton, 2005). Lamberton (2005) concluded that the activities of an organisation which damage the critical natural capital are unsustainable. In trying to account for sustainability using the sustainable cost calculation model, Bebbington & Gray (2001) concluded that the SCC model could not account for the sustainable costs accurately. The model tend to understate the sustainable costs greatly. Therefore, it is logical to conclude that unsustainability may not be easily reversible (Phillis & Andriantiatsaholiniaina, 2001).

Phillis & Andriantiatsaholiniaina (2001) argue that the concept of sustainability is subjective. What appears sustainable to an environmentalist may be unsustainable to an economist or an accountant; therefore, what constitutes sustainability to these groups of people may differ (Schaltegger & Zvezdov, 2015). In light of this research, unsustainable business entails organisations which have high environmental impacts and do not take into consideration the use of EMA systems in order to address the environmental impacts.

2.2. The concept of Environmental Management Accounting

According to Burritt & Saka (2005), Environmental Management Accounting (EMA) is a new environmental management tool kit which was, at first and originally, designed to trace, track and analyse environmental costs and physical environmental flows. In order to fully understand this concept it is of paramount importance to define the concept first and then understand the historic background or setting which brought EMA to life, its fundamental concepts and how it is being applied in developing and developed countries.

2.2.1. Defining Environmental Management Accounting (EMA)

The well-spoken definitions of Environmental Management Accounting were put forward by IFAC (2005), United Nations (2001b), Jasch (2006a), Schaltegger & Burritt (2010) among other academics and professional bodies. These definitions are broad in their coverage of the meaning of Environmental Management Accounting which is often referred to as environmental accounting. In actual fact EMA is a subset of EA. The language used in Environmental Management Accounting or environmental accounting is not standardised to an extent that EMA has been variously called EA, EMA, environmental cost accounting (ECA), full cost accounting (FCA), total cost accounting (TCA) and many other names which the study looks at to understand their deeper meaning (IFAC, 2005). It is, therefore, important to clarify the definition of Environmental Management Accounting and the language which will be used in this study to avoid misunderstanding of the term.

This study adopted the United Nation's definition of EMA, but is it enough to adopt it without giving the reasons for leaving other definitions which are given in literature? The Table 2.2 below summarises the different definitions which are given by various authors.

Table 2.2 Definitions of EMA

Sources	**Definitions**
Academic	
Graff *et al.*, (1998)	Environmental Management Accounting is the way that businesses account for the material use and environmental costs of their business. Materials accounting is a means of tracking material flows through a facility in order to characterize inputs and outputs for purposes of evaluating both resource efficiency and environmental improvement opportunities. Environmental cost accounting is how environmental costs are identified and allocated to the material flows or other physical aspects of a firm's operations.
Xiaomei (2004)	It is a new branch of accounting which is under the direction of sustainable economic development goal, using the basic accounting theory and method to recognize, measure and report the environmental management system and report the environmental impact of economic activities of a business.

Schaltegger & Burritt (2000)	EMA is defined in a narrower sense to include only the environmentally induced financial aspects of accounting that help managers to make decisions and be accountable for the outcome of their decisions.
Bennet & James (1998)	The generation, analysis and use of financial and non-financial information in order to optimise corporate environmental and economic performance and to achieve sustainable business.
Jasch (2003)	Environmental management accounting represents a combined approach which provides for the transition of data from financial accounting, cost accounting and material flow balances to increase material efficiency, reduce environmental impact and risk and reduce costs of environmental protection.
Professional	
International Federation of Accountants (2005)	Environmental management accounting is the management of environmental and economic performance through the development and implementation of appropriate environment-related accounting systems and practices. While this may include reporting and auditing in some companies, environmental management accounting typically involves life-cycle costing, full cost accounting, benefits assessment, and strategic planning for environmental management.
United Nations (2001)	Environmental management accounting serves as a mechanism to identify and measure the full spectrum of environmental costs of current production processes and the economic benefits of pollution prevention or cleaner processes, and to integrate these costs and benefits into day-to-day business decision-making.

Source: Alcouffee *et al.*, (2010)

The definitions compiled by Alcoufee *et al.*, (2010) as cited in Burritt & Saka (2005) have different emphasis which are explained in the next few paragraphs. Graff, Reiskin & Whitebidwell (1998) define Environmental Management Accounting with an emphasis on material flows and environmental costs and the accountability, thereof, by businesses. The authors go on to explain the meaning of material flows and environmental costs to substantiate the definition. Xiaomei (2004) brings out the issue of sustainable development in his definition which the first author does not talk about and which can also be believed to be inherent in the definition. Xiaomei (2004) specifies EMA

as a way of recognising, measuring and reporting the environmental management system (EMS) and the environmental impacts of economic activities. Though the researcher agree with the measurement of environmental impacts of economic activities, it might be difficult to measure and report the environmental management systems. This brings out the wideness of the EMA definition as it is not clear what exactly will be done when recognising, measuring and reporting the EMS. This needs a further explanation by the author and it brings out the vagueness in the definition.

Schaltegger & Burritt (2000) explain that EMA has been defined in a narrower sense to include environmental aspects of financial reporting with an emphasis on decision making. To sum it all up, their decision making is more aligned to environmentally related decisions. This definition is completely different from the two definitions given above though the environmental aspect is found in all the definitions, but their main thrust differs widely. Bennet & James (1998) define EMA in a sustainable manner by use of financial and non-financial information in order to increase or optimise environmental performance. The definition describes decision making in a subtle manner. This makes this definition close to Schaltegger & Burritt (2000) definition because of their emphasis on decision making. Bennet & James (1998) go further to include the achievement of sustainable businesses by employing the use of financial and non-financial information. This definition is closely aligned to Xiaomei (2004)'s definition in terms of the sustainable development part of EMA. The weakness of this definition is that it does not mention whether the financial or non-financial information being used is environment related or its just generic information which in turn will help optimise corporate environmental and economic performance.

Jasch (2003) further compresses the definition by stating that Environmental Management Accounting is a combined approach which involves the transition of data from all the branches of accounting to increase material efficiency (material flow) and reduce environmental impacts. The major emphasis of this definition is material flow efficiency and the reduction of environmental impacts, thereby achieving cost savings in terms of reduced environmental liabilities. The definition is closely aligned to Graff *et al.*, (1998)'s definition which points out to material flows as well as Schaltegger & Burritt, (2000)'s definition which specifies the financial aspects of accounting related to the transition of data from financial accounting, cost accounting and material flow balances. Though Jasch (2003)'s definition does not specifically include the word "sustainability", the building up of the definition to a point of reducing environmental impacts, risk and environmental costs, indicates the inclusion of sustainability in Environmental Management Accounting definitions.

There is no logical coherence in these definitions which indicates that EMA points to the same thing, and this makes EMA difficult to understand. The International Federation of Accountants, IFAC

(2005) tried to come up with a comprehensive definition which takes into consideration the concerns of the above authors by emphasising the management of environmental costs and economic performance by implementing appropriate environment-related accounting systems which Xiaomei (2004) called environmental management systems. The definition suggests the different names which are given to EMA in companies. The definition does not indicate the issues of sustainability. It is still very broad and tries to capture what EMA is being considered to be in different organisations.

The United Nations (2001b) defines EMA with an emphasis on measuring environmental costs of production processes, the economic benefits of cleaner processes and the integration of these into day-to-day business decision making. EMA, according to UN, should give information on which to base our decisions, identify areas of benefits and give environmental costs. It is however, sad to note that the definition does not indicate issues of sustainability though the pillars of sustainability are found in the definition. The economic benefits should also be cleaner processes or environmental related processes (Qian, Burritt & Chen, 2015). The positive thing about the definition is that UN tries to operationalise EMA into day-to-day business decision making. The definitions, somehow, relate to Schaltegger & Burritt (2000)'s definition which talks about decision making and the accountability of managers.

All the definitions have the measurement of environmental impacts in common in order to reduce environmental costs and liabilities, but this can only be done if management makes decisions based on the information they get from environmental accounting systems. The definitions need to be taken holistically and not individually since all of them have good aspects of EMA. To the author's knowledge and understanding, the IFAC and UN definitions are more comprehensive than isolated academic definitions. The definition for this study, however, needs not be taken in isolation in order to fully comprehend what EMA is. The UN definition has been taken because it reduces EMA to day-to-day business decision making, harnessing environmental costs/impacts and benefits. There is, however, need to seriously consider the transition of data as mentioned by Jasch (2003) from financial accounting and cost accounting to Environmental Management Accounting in order to optimise environmental and economic performance.

The non-financial and financial aspects mentioned by Bennet & James (1998) should be stated as environmental financial and non-financial aspects. This then means the definition will almost agree with Schaltegger & Burritt (2000) when they mention that EMA includes environmentally induced financial aspects of accounting.

Burritt (2005:22) explains and defines management accounting as consisting of six possible words or phrases. These are environment, management, accounting, environmental management, management

accounting and Environmental Management Accounting. The author states that appreciation of each of the phrases helps in understanding of the whole.

2.2.2. History of Environmental Management Accounting

"Environmental Management Accounting is relatively new as a field of research and practice in which the first use of the term dates back only to the 1990s" (Bartolomeo *et al.*, 1999 as cited in Burritt *et al.*, 2002; Gray, 2010b:47; Lamberton, 2005; Parker, 2011; Schaltegger *et al.*, 2013; Schaltegger & Zvezdov., 2015). EMA came as a result of the need to manage environmental impacts. Though there are many schools of thought as to the origin of Environmental Management Accounting, some referred to EMA as fads or fashion/trends (Burritt & Schaltegger, 2010), competition, mimetic, coercive or normative isomorphism which brought EMA to life (Lodhia & Hess, 2014; Qian *et al*., 2015; Qian, Burritt & Monroe, 2011). The increasing need for environmental protection and environmental management led to the development of the EMA concept. There is also the issue of relevancy and environmental efficiency as well as institutional theory which come to play when we talk about the history of Environmental Management Accounting. These are the ideals that companies hold as the need to have an EMA system, either to achieve environmental efficiency or to do as others in the same industry are doing, or a matter of good faith in terms of the ideals of the communities in which companies operate. All these theories are believed to have contributed towards the history and development of EMA. Developing countries spearheaded EMA with their mega factories which make it mandatory for them to be environmentally conscious. Literature is of the view that EMA is said to be everywhere (developing and developed countries) and it is a concept which has come to stay. EMA is no longer a western phenomenon and is spreading all over the world (Gray, 2010b; Lamberton, 2005). EMA has enjoyed a strong rate of adoption in several Asian countries which are implementing it.

Johnson & Kaplan (1987) published a book in which they exposed the weaknesses of management accounting which led to the development of good theories which are in use today like activity based costing, the activity management approach to total quality management, and overhead absorption costing among other concepts. During this period it was also noticed that management accounting was inadequate to address all aspects of environmental impacts. Therefore, this has led to the need for Environmental Management Accounting, which brings environmental aspects of accounting together with decision making and control. Environmental Management Accounting addressed the inadequacies of financial accounting and management accounting. Management accounting systems were no longer providing adequate information for decision making (Johnson & Kaplan, 1987). The

information which was needed for decision making included environment related information among other types of decision making information.

It was only in the 1990s that concern for the relationship between business and the environment became generally recognised in many countries, especially in the developed world (Bennett *et al.*, 2004a:3). This became the mainstream issue in business. The main concerns were compliance with environmental legislation and regulations which grew to environmental performance as a responsibility to society and the external stakeholders. This responsibility later grew to environmental performance as a management tool, profit making and cost saving measure.

Figure 2.2 below illustrates the growing interests in environmental management research from the 1990s. The research in EMA started by Gray (1992)'s publication which catapulted interest in the subject area (Bennett *et al.*, 2004b; Gray, 2010b; Lamberton, 2005).

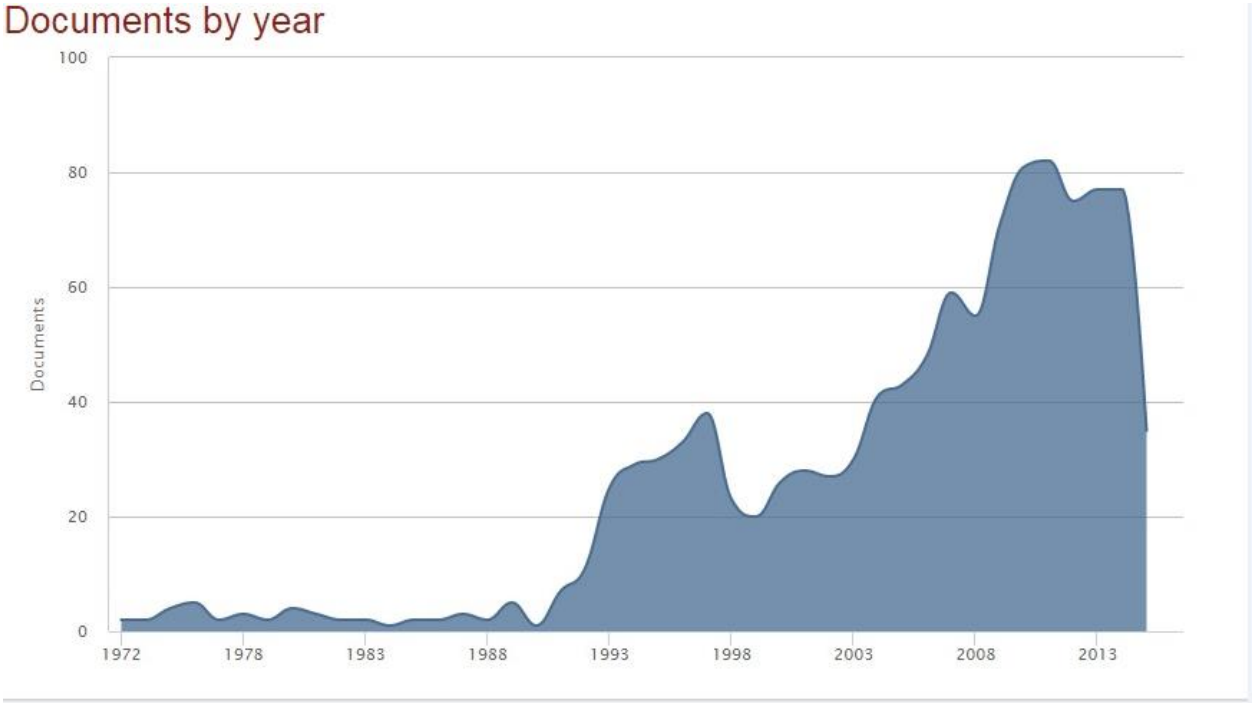

Figure 2.2 EMA publications from 1972-2015[2]

Source: Scopus Database (2015)

2.2.3. EMA in developed countries

EMA is being promoted by groups such as the United Nations Division for Sustainable Development (UN DSD), United Nations Environment Programme (UNEP), European Union (by funding the Environmental Management Accounting Network (EMAN) which is a group formed by people of

[2] Refer to footnote 1 (Figure 2.1, page 59) on how the information was derived from Scopus

like minds to promote environment management all over the world) and Tellus Institute (through the Environmental Management Accounting Research and Information Centre (eMAric)) (Rikhardsson *et al.*, 2005). All these institutions are led by developed countries with their head offices in European, Asian, American and Australian countries (Qian *et al.*, 2015). The developed countries embraced EMA because of the need to achieve a win-win situation between environmental performance and organisation performance (Laine, 2005). Companies were growing bigger and becoming reckless in addressing environmental impacts in monetary and physical terms. EMA has networks which are growing in leaps and bounds. The companies in developed countries are either self-regulating in the EMA implementation or they are forced by government regulations to embark on projects which promote environmental protection and at the same time ensure that businesses remain viable and profitable.

2.2.4. EMA in developing countries

Environmental Management Accounting is taking on increasing importance in developing countries, with South Africa leading the developments in EMA through the Environmental Management Network (EMAN) Africa. The discipline is growing slowly with academics leading the vanguard in EMA (Ambe, 2007; Ferreira, Moulang & Hendro, 2010; Qian *et al.*, 2015). The head of EMAN Africa is stationed at Limpopo University in South Africa. Tshwane University has established a fully-fledged Department of Environmental Management Accounting and researchers in this department are looking at modalities of how EMA may be applied in Africa and other developing countries (Ambe, 2007).

Multinationals from developed countries find a haven for exploiting mineral resources in Africa with few environmental regulations(Jones, 2010:129; Lodhia & Hess, 2014; Murombo, 2013; Tsamenyi *et al.*, 2017). This is seen through many companies, all over the world operating in Africa without implementing the systems which are mandatory in developed countries.

Africa and other developing countries have not developed an EMA framework to be used and adopted in their countries like other developed countries in Europe, Asia and Australia. It is a concern among the academics and professionals that the pace at which environmental management issues are penetrating in Africa is very low (Ambe, 2007; Kumah, 2006; Lodhia & Hess, 2014). This has led to multinational companies viewing developing countries as a breeding ground for their organisations which may not survive in developed countries because of high environmental regulations surrounding the sector which has high environmental impacts.

Currently, environmental regulations are seen in Africa as just regulatory requirements in some instances where environmental assessments are needed before operation (for example, in the mining

and extractive industries), not as an area that has potential to improve environmental performance and ultimately business performance. In some instances, this is seen as an unnecessary expensive evil in the eyes of multinationals which are concerned with reaping profits from the developing countries (Murombo, 2013).

There are many misconceptions in EMA. Some of the misconceptions are that EMA is expensive and requires huge capital investments to implement; EMA is difficult to implement in small and medium companies; few benefits may be obtained through this system; and also that EMA is inherent in the company's management systems. These misconceptions are leading to the slow adoption of EMA in developing countries (Ambe, 2007).

2.2.5. Components in EMA

As alluded to earlier, when the study looked at EMA definitions, there were many components of EMA and it is important to look at these components in order to understand what constitutes Environmental Management Accounting. Some of these components are taken to be EMA in many companies all over the world and some companies take the components as part of conventional management accounting systems. In the next few sections, the researcher explains these components in relation to what prominent authors say, at the same time establishing the building blocks for this research.

2.2.5.1. Full cost accounting (FCA)

EMA has variously been called environmental accounting (EA), Environmental Management Accounting (EMA), environmental cost accounting (ECA), full cost accounting (FCA), total cost assessment (TCA) and many more other technical accounting terms (IFAC, 2005; United Nations, 2001a). This, then, means it is important to clarify these terms. Full cost accounting is an environmental accounting initiative that attempts to take external costs into account. It has been developed to ensure that business decisions take full account of an organisation's wider environmental impacts. FCA is similar to EMA in the sense that it looks at environmental impacts not within the organisation but externally and it is very broad, hence, it assumed the name 'full cost accounting'. Antheaume (2004) as cited in Alewine (2010) states that in full costing (external costing) there are three valuation methods which are used by companies and these are the avoidance cost method, the damages cost method and the collective consent to pay method. The author mentioned this when he was looking at the implementation of three different full cost environmental accounting methods at a company. Regardless of the cost methods used, the society does not cover the difference between recorded costs and actual environmental harm. In some cases, the society has to pay dearly

for the environmental harm. The full cost accounting method tries to ensure that externalities are included in decision making to avoid harmful environmental impacts on the society as well as on the business performance.

Full cost accounting is regarded by Christ & Burritt (2012) as a tool and technique designed to manage environmental impacts. The tools may also include life cycle costing (which we shall look at in the next section); environmental life cycle budgeting; environmental capital investment appraisal; total quality environmental management; and material and energy-flow accounting. Therefore, full cost accounting is not the same as EMA. This is simply a tool designed to help in managing environmental impacts. The tool helps in the overall achievement of EMA. Since EMA is believed to help in internal decision making, the coming in of full cost accounting helps in the ability of EMA to look at the external costs. Full cost accounting encompasses the full accounting of all environmental costs (United Nations 2001a).

(Antheaume, 2004) clearly states that full cost accounting provides financial information for both private costs and external costs. Private costs are the costs which are incurred by companies trying to minimise environmental impacts while external costs are the costs to a society of a company's activities. Private costs are usually disclosed or described in financial and non-financial terms while the external costs are mainly disclosed in non-financial terms through the use of texts documenting the company's impacts. Bebbington *et al.*, (2001) as cited in Antheaume (2004) define full cost accounting as "a system which allows current accounting and economic numbers to incorporate all potential/actual costs and benefits into the equation including environmental (and perhaps) social externalities to get the prices right". The IFAC (2005) simply describes FCA as the estimation of environmental impacts and costs.

There are contrasting and divergent views in literature of what FCA is. The United Nations (2001) states that FCA does not account for externalities (that is, social and environmental costs) associated with solid waste management, while the other body of literature states that FCA takes care of all costs which include externalities (Alewine, 2010; Antheaume, 2004; Bebbington et al., 2001; Christ & Burritt, 2012; Gale, 2006b; Herbohn, 2005). Though FCA is considered to be similar to EMA, it has one main difference, that is, FCA focuses primarily on costs, with physical flow information as a cost driver. This primary focus on costs is not articulated clearly to indicate whether the costs referred to include plant wide costs as well as social and environmental costs referred to as externalities or not. There is, therefore, need to clearly understand what FCA encompasses.

2.2.5.2. Total cost assessment (TCA)

Total cost assessment is similar to EMA but does not mean the same thing. TCA is a term which is used to describe the broadness of EMA. This is a model developed in order to consider the environment in investment decisions (Bartolomeo *et al.*, 2000). The environment is considered in terms of the total costs which have an impact on the environment. These might be internal costs or external costs. In many cases, TCA refers to the total internal costs which have an impact on the environment and the economic performance of an organisation.

In some instances, TCA may involve the assessment of total annual corporate environmental costs and potential savings brought by environmental management. The information obtained is useful in decision making. Total cost assessment is necessary in the overall achievement of EMA and corporates should be in a position to know all its potential cost and savings before embarking on implementing a project which has a positive or negative impact on the environment. The assessment should include experts from all fields, for example, environment managers, accountants and engineers. If the TCA is properly done, EMA systems tend to help organisations make meaningful decisions and benefit from the implementation of EMA.

Total cost assessment can also be referred to as environmental cost assessment (Jasch, 2006b). It is important to determine material flows for raw materials and auxiliary material in TCA. This determination of material flows helps in realising cost savings. Most of the costs in TCA are not strictly environmental but closely related to material flows within organisations which have environmental impacts as well as economic impacts (Jasch, 2006b).

According to Jasch (2003), the core focus of EMA and EMA UN DSD is to assess the annual environmental expenditure and benefits/cost savings on emission treatment, disposal, environmental protection and management. The material purchase of non-product items and the production values are included. This total assessed cost usually gives frightening figures to corporates which prompts them to act in order to improve their systems and material efficiency options. The total costs obtained are usually classified as costs of inefficiency (Bartolomeo *et al.*, 2000). The focus of EMA, in other words, is on being able to do an assessment of the total costs efficiently in order to improve environmental efficiency.

2.2.5.3. Natural resource accounting (NRA)

Natural resource accounting is used to contextualise environmental accounting together with other terms. NRA is explained by IFAC, (2005) as the accounting for stocks and flows of natural resources in both physical and monetary terms. Natural resource accounting is simply accounting for natural

resources impact within a nation, organisation or society together with its environmental impacts in either monetary or physical terms. Accounting for these natural resources is closely linked to this study which is looking at the impact of EMA in the mining sector in Zimbabwe.

Usually, governments lead the natural resource accounting and come up with reports which indicate the possible number of natural resources within a society and their values in monetary and physical terms. Some governments, like South Africa, end up producing the national resources accounts reports which are useful to companies and researchers.

2.2.5.4. Life cycle assessment (LCA)

EMA includes the assessment of the product life cycle or activity life cycles. This assessment is not prominent in literature and in EMA definitions. It is, however, worthy to mention it because of its inherent nature in Environmental Management Accounting. Life cycle assessment (LCA) is one of the several instruments available to mining companies wishing to evaluate and document the environmental impacts of their activities or operations (Sinding, 1999). Some of the instruments include environmental impacts assessments (EIAs), environmental management systems (EMS), environmental accounting (EA) and environmental audits and reports (Sinding, 1999).

Life cycle assessments focus on the product itself rather than the process (in isolation of the product) or the production site from the inception of the idea to the maturity and disposal of the product which is termed "from cradle to the grave" of the product (Burritt & Saka, 2005). The LCA approach focuses on the environmental impacts of the product itself or from the product. Since LCA is mostly used in the mining sector as indicated by Sinding (1999), LCA will help in focusing on the environmental impacts caused by the production of minerals in the sector. It will help also in looking at the environmental impacts of the minerals themselves inside the companies as well as outside the companies (the externalities). The major product processes of a product can be evaluated through the use of LCA. LCA is one of the many EMA tools (like investment appraisal, budgeting, calculating savings or costs) which gets data from material flow accounting and environmental cost accounting which are the basic EMA tools (Jasch, 2006b).

In some cases, Environmental Management Accounting terminology often uses life cycle to emphasise that conventional management accounting approaches overlook important environmental costs and benefits (USEPA 1998a as quoted in Qian *et al.*, 2011). This shows that life cycle assessments have a reflection on the environmental impacts (costs and benefits) of the activities which will be undertaken. Burritt (2005:23) sums it all up by stating that life cycle costing (or assessment) "focuses on the impact of all functions of the business rather than a narrow group such as production, which was the special preserve of conventional cost accounting".

2.2.5.5. Two major areas of EMA

Environmental Management Accounting consists of two major areas which are Monetary Environmental Management Accounting (MEMA) and Physical Environmental Management Accounting (PEMA) (Ambe, 2007; United Nations, 2001b). These two categories work hand in hand as the physical EMA feeds into the monetary EMA (IFAC, 2005). To buttress the two dimensions of environmental accounting, Sinding (1999) states that the environmental accounts may be expressed in two different ways which are environmentally differentiated accounting and ecological accounting. The former refers to monetary identification of costs in essence which is MEMA and the later refers to the physical environmental costs described as PEMA in the EMA framework by Burritt *et al.,* (2002).

PEMA and MEMA are terms proposed to define EMA in general (Burritt *et al.,* 2002). Monetary Environmental Management Accounting (MEMA) deals with environmental aspects of corporate activities expressed in monetary units and generates information for internal management use. It is based on conventional management accounting practices (Alcouffe *et al.*, 2010; Burritt *et al.,* 2002) that have been adapted to include environmental aspects. MEMA is the central, ubiquitous tool which provides information for decision making by its ability to track, trace and treat costs and revenue incurred because of the company's environmental impact. MEMA acts as a control and accountability devise. On the other hand, PEMA acts as an information tool for decision making by internal management. PEMA focuses on the company's impact on the natural environment expressed in physical units such as kilograms and labour hours (Ambe, 2007). PEMA tools are designed to collect unit physical environmental impact information for internal use and decision making by management (Ambe, 2007; Schaltegger & Burritt, 2000 as quoted in Burritt *et al.,* 2002). Both PEMA and MEMA are internal environmental management systems which also feed the external reporting system. When this external reporting happens, PEMA and MEMA will be referred to as physical external environmental accounting and reporting (PEEA) and monetary external environmental accounting and reporting (MEEA). Figure 2.3 below illustrates the above explanation of internal vs external and monetary vs physical EMA.

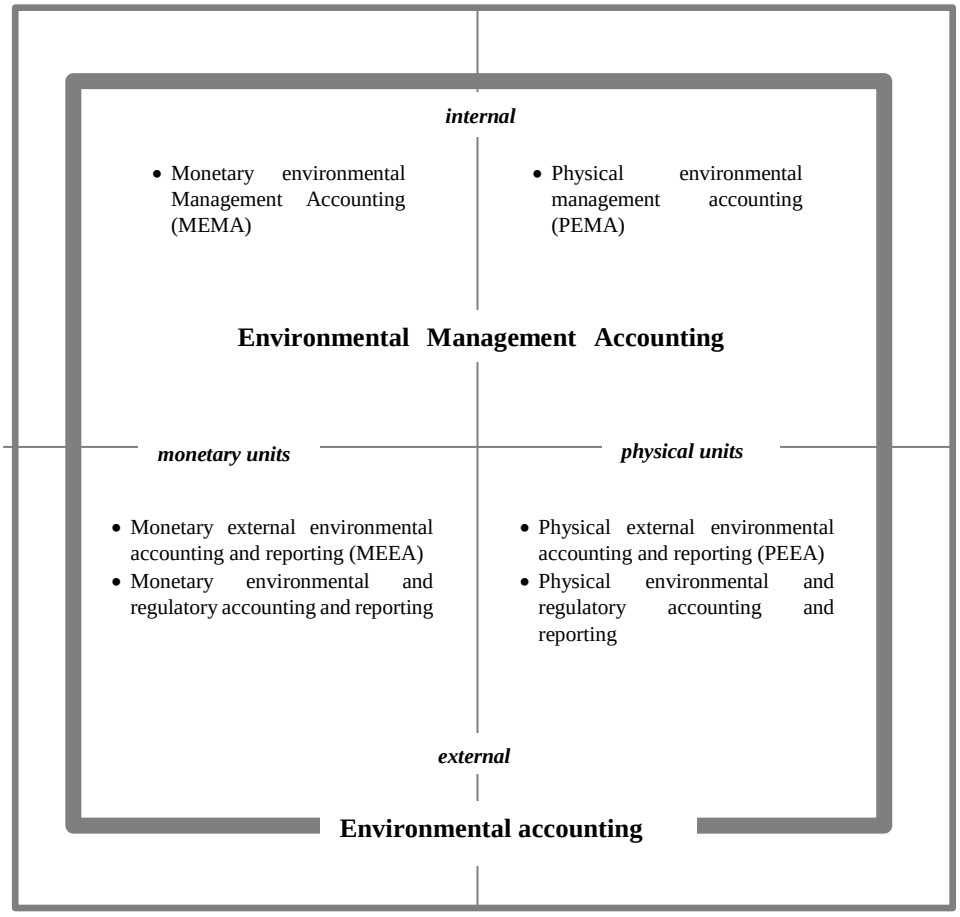

Figure 2.3 Environmental accounting systems

Source: Burritt *et al.*, (2002)

Accountants work together with sustainability managers and other environmental experts to collect physical environmental information which can be measured in terms of, for example, volume of pollution emissions in the air or amount of dirty water disposed from production processes. This physical information will be quantified in monetary terms to come up with environmentally differentiated reports which can be useful for decision making. The identification of PEMA and MEMA in a company is clearly visible and these two categories work hand in hand. It is of paramount importance to clearly distinguish between the two types of information in order to save different needs of stakeholders in Environmental Management Accounting.

2.3. Conventional Accounting vs Sustainability Accounting

The sustainability accounting framework developed by Lamberton (2005) gives a good analogy of conventional accounting and sustainability accounting or EMA. The framework clearly spells out that the sustainability accounting model was developed from a traditional or conventional accounting model with similar principles and concepts (Lamberton, 2005; Schaltegger & Zvezdov, 2015). The

only risk of having a framework that is similar to conventional accounting framework is the risk of replicating the conventional accounting model in Environmental Management Accounting. This model will pose the same weaknesses as the conventional accounting model.

As much as conventional accounting has performance indicators in the form of profit and loss, balance sheet and cash flow statements, EMA has performance indicators which are stipulated in the global reporting initiatives guidelines following after the three dimensional definition of sustainability in which performance indicators are given in the order of the Triple Bottom Line(TBL), that is ecological indicators, social indicators and environmental indicators (Lamberton, 2005).

Conventional accounting is traditionally based on accounting principles and standards produced by the International Federation of Accountants. The international standards (that is, International Accounting Standards (IASs) and International Financial Reporting Standards (IFRSs)) do not override the national standards. They guide the production of financial reports and the reporting of financial information (Deegan, 2013:452) to external stakeholders and they enhance transparency, reliability and comparability of financial statements in the same industry over a period of time. In cases where a nation does not have national standards the global accounting standards take precedence and it is mandatory to comply with them for global competitiveness and transparency.

Sustainability accounts are currently guided by the global reporting initiative (GRI) guidelines on sustainability. These guidelines are not mandatory but optional; companies are at will to use them. The guidelines, however, help organisations to report their sustainability accounting initiative in a more clear and concise manner which is easy to understand at a global level. The standards borrow from accounting standards in many aspects which are more similar to accounting (Deegan, 2013; Thornton, 2013), for example, the capital maintenance principle (Lamberton, 2005), materiality concept, consistency concept and reliability concept (which can be tested through audit of the sustainability reports). These concepts/principles were borrowed from the then generally accepted accounting principles (GAAP) and statement of accounting practice (SAP) which have been replaced (especially in Southern Africa) by the IFRSs and IASs. The capital maintenance standards were developed to relate to sustainability accounting in which natural capital should be accounted for.

Conventional accounting did not address the environmental issues thereby bringing Environmental Management Accounting which has an environmental dimension that focuses on ecological accounting, social accounting as well as economic accounting which is similar to the conventional accounting (Ambe, 2007). Financial accountants argue that conventional accounting addresses the environmental aspects. It is failure by practitioners to comprehend the application of the wide array of standards developed to address environmental impacts which enhances sustainability within

organisations in different sectors of the economy. Gray (2013) bluntly argues in no uncertain terms that financial accounting *per se* (sic) has no obvious interest in the environment. These are contrasting views from accounting practitioners and academics. Gray (2013) further argues that conventional financial accounting systems that encourage growth, profit and efficiency at the expense of social and environmental damage should acknowledge that it is the most likely cause of environmental desecration. This argument is also supported by Deegan (2013) who posits that financial accounting conventions do not support sustainability reporting in any way. The promotion of growth and profit at the expense of the environment simply means not embracing the concept of sustainability in day to day business decision making.

There are components of conventional accounting model which are similar to components of sustainability accounting. These are listed in Table 2.3 below.

Table 2.3 Components of FA model and SA model

Conventional Accounting Model	**Sustainability Accounting Model**
1. The accounting reports (Elliot & Jacobson, 1991)	1.objective(s) of the sustainability accounting framework;
2. Accounting principles (Solomons, 1995)	2. principles which underpin application of the framework;
3. Accounting records (Ijiri, 1983)	3. data capture tools, accounting records, and measurement techniques;
4. The objective of the accounting model (Martin, 1994).	4. reports used to present information to stakeholders;
5. Qualitative attributes (SAC 3)	5. qualitative attributes of information reported using the framework.

Source: Lamberton (2005)

The table clearly indicates the similarities in the components of the two models which show that EMA is being constructed from the already existing conventional accounting framework. The components will be discussed further in the following sections.

Widespread environmental impacts and their related costs together with the failure of conventional management accounting systems to provide adequate information to mitigate against these impacts and costs led to the emergence of EMA (Jamil *et al.,* 2015).

2.3.1. Components of EMA reports

The typical EMA reports developed by IFAC (2005) and United Nations (2001b) are as follows:

ENVIRONMENTAL DOMAINS ENVIRONMENT- RELATED COST CATEGORIES	Air and Water	Waste water	Waste	Soil, Groundwater	Noise and Vibration	Biodiversity and	Radiation	Other	Total
1. **MATERIALS COSTS OF PRODUCTION**									
• Raw and Auxiliary Materials									
• Packaging Materials									
• Water									
2. **MATERIALS COSTS OF NON-PRODUCT OUTPUTS**									
• Raw and Auxiliary Materials									
• Packaging Materials									
• Operating Materials									
• Water									
• Energy									
• Processing costs									
3. **WASTE and EMISSION CONTROL COSTS**									
• Equipment Depreciation									
• Operating Materials									
• Water and Energy									
• Internal Personnel									
• External Services									
• Fees, Taxes and Permits									
• Fines									
• Insurance									
• Remediation and Compensation									
4. **PREVENTIVE and OTHER ENVIRONMENTAL MANAGEMENT COSTS**									
• Equipment Depreciation									
• Operating Materials, Water, Energy									
• Internal Personnel									
• External Services									
• Other									
5. **RESEARCH and DEVELOPMENT COSTS**									
6. **LESS TANGIBLE COSTS**									

Figure 2.4 Environmental related costs by environmental domains

Sources: (IFAC, 2005)

ENVIRONMENTAL MEDIA ENVIRONMENT- COST/EXPENDITURE CATEGORIES	Air /Climate	Waste water	Waste	Soil/ Groundwater	Noise/ Vibration	Biodiversity/ Landscape	Radiation	Other	Total
1. WASTE and EMISSION TREATMENT									
1.1 Depreciation for related equipment									
1.2 Maintenance and operating materials and services Materials									
1.3 Related personnel									
1.4 Fees, taxes, charges									
1.5 Fines and penalties									
1.6 Insurance for environmental liabilities									
1.7 Provisions for clean-up costs, remediation									
2. PREVENTION and ENVIRONMENTAL MANAGEMENT									
2.1 External services for environmental management									
2.2 Personnel for general environmental management activities									
2.3 Research and development									
2.4 Extra expenditure for cleaner technologies									
2.5 Other environmental management costs									
3. MATERIAL PURCHASE VALUE OF NON-PRODUCT OUTPUT									
3.1 Raw materials									
3.2 Packaging									
3.3 Auxiliary materials									
3.4 Operating materials									
3.5 Energy									
3.6 Water									
4. PROCESSING COSTS OF NON-PRODUCT OUTPUT									
∑ Environmental expenditure									
5. Environmental revenues									
5.1 Subsidies, awards									
5.2 Other earnings									
∑ Environmental revenues									

Figure 2.5 Environmental expenditure/cost and revenue/earnings

Sources: United Nations (2001b)

The EA or EMA reports are not cast in stone but differ as much as the use of the word EMA or EA differs within organisations (Schaltegger & Zvezdov, 2015) but with the same meaning of accounting

for the environment in financial and physical terms. The cost and revenue categories of environmental reports differ widely depending on the organisation. Figure 2.4 and Figure 2.5 were developed specifically for the manufacturing sector. Therefore, the cost categories are bound to differ with the extractive industry because the environmental impacts in the extractive industry are higher than in the manufacturing sector. The components found in the manufacturing sector are helpful in the development of the mining sector specific environmental reports.

Figures 2.4 and 2.5 reporting cost categories above are not exhaustive. These are meant to be guidelines. The uniqueness of the company or industry determines the actual cost categories to be included in environmental reports. Lamberton (2005) generalised the components of a sustainability accounting model in which the author indicated that any accounting report should start with the objectives of a sustainability accounting framework; followed by principles which guide the application of the framework; data capturing tools, accounting records, and measurement techniques, and then on the fourth position was the reports used to represent information to the stakeholders. The report should also give qualitative aspects of information reported. The reports should typically be in the form of figures 2.4 and 2.5. Lamberton (2005) did not indicate how the reports should look like which this research is concerned with.

2.3.2. Components of conventional accounting reports

Conventional accounting reports have been in existence for a long period. They guide how all other accounting reports should be like with a possibility of influencing all accounting reports. The conventional financial reports are broken down into six sets: statement of financial position as at the end of the period; statement of profit or loss and other comprehensive income for the period; statement of changes in equity for the period; a statement of cash flows for the period; and notes comprising a summary of significant accounting policies and other explanatory information (IASB, 2010a).

The accounting reports have different sections which are guided by the accounting principles, concepts and standards. In these sections, you find information relating to environmental expenditures, revenues, assets, equity and liabilities depending on the nature of the business in which the organisation will be operating.

(Lamberton, 2005) considers the accounting reports an important component of the conventional accounting model. The accounting report is a generic term which can be used to refer to all the reports given above. It is important to go beyond and indicate the actual subsections of conventional accounting reports. The conventional accounting reports are generic in nature and they do not account for environmental costs separately but indicate the consolidated financial performance of a business (Ambe, 2007). This is not ideal for making environmental related decisions in light of improving

environmental sustainability. The major thrust of the components is to indicate whether a company is making a profit or loss as well as to indicate if the company is liquid enough to keep operating for a foreseeable future.

2.3.3. The role of accountants in Environmental Management Accounting

Accountants play a very crucial role in information management for decision making purposes by middle management, top management and various stakeholders. They were described by Schaltegger & Zvezdov (2015) as gatekeepers of sustainability information. They exert a gate keeping role between sustainability managers and top management. This is because accountants are believed not to have sufficient sustainability and environmental management information and hence are afraid of losing their power of influence within the organisation structures; therefore, they decide what information to give to management and to withhold from management. Besides this gate keeping role accountants act as brokerages between management and stakeholders of the company. That is, they facilitate exchange of sustainability accounting information. They know what information to report to stakeholders through external reports and what information to give to management through management accounts for decision making purposes. Information is power and hence the power of accountants lies in the proper management of information.

There are disagreements in literature when it comes to management of sustainability information. The sustainability and environmental managers believe that accountants are being given the role of managing Environmental Management Accounting information without prior knowledge and experience in sustainability (Mathews, 1997). Management seems to be ignorant of that and accountants are not delivering as per expectations of sustainability gate keepers. Hence there is need to educate accountants in the area of sustainability accounting information management. Management believes that accountants are properly positioned to management sustainability information and channel it to the proper people for decision making purposes. Accountants have the agility and dexterity needed to collect different types of relevant information from all departments which are environment related for analysis and then convey it to various stakeholders for decision making. This is contrary to what the sustainability managers and environmental managers believe. It is over two decades now and the accounting professional has not yet developed fully fleshed consistent Environmental Management Accounting standards (Deegan, 2008). Companies rely on guidelines which are not auditable or mandatory like the generally accepted international financial reporting standards.

Empirical evidence show that accountants do not know how to account for sustainability information within organisations and the greater part of sustainability accounting is being done by sustainability

managers and environmental managers. Accountants acknowledged that they are not aware of what they are expected to do. This is in agreement with IFAC observation that Environmental Management Accounting principles and practices are clearly transcribed in accounting standards (IFRSs and IASs) but the corporate world does know how to apply this knowledge (IFAC, 2005). Deegan (2013) opposes the whole idea of financial accounting conventions and principles being able to be applied in environmental accounting. Deegan (2013) states that financial reporting as transcribed in the conceptual frameworks and accounting standards has too many conventions that act to eliminate the ability of financial accounting to respond to social and environmental concerns. This means a lot of training needs to be done for accountants to fully embrace this new development. There should be a standard way of coming up with environmental reports or accounting for the environment but Environmental Management Accounting systems differ greatly in different companies (Schaltegger & Zvezdov, 2015) even in the same industry and country because of this lack of standardisation and knowledge deficiency.

The accounting profession might face criticism if environmental management accounting concerns are not properly handled. Accountants are acting as gatekeepers (see for example, Schaltegger and Zvezdov (2015) in many areas which have been traditionally under their influence. Ordinarily stakeholders are more concerned about management of environmental information for decision making purposes. There is a massive and great shift being witnessed in the past two decade towards environmental aligned reporting. The emerging markets make it mandatory for companies to show their environmental initiatives in order to trade in highly competitive “green markets”. If the accountants keep playing the gate keeping role rather than producing environmental benign information, the profession may be criticised by the other professions who are better prepared to report sustainability initiatives in monetary and non-monetary terms.

The possible reason accountants should be better placed to handle Environmental Management Accounting information is that accounting as a central information system of the company is recognised as an approach for tackling sustainability challenges and that their expertise in handing large amounts of information, means that they are able to synthesise it, make sense out of it and then communicate it to various stakeholders for decision making purposes. If this crucial skill could be channelled to Environmental Management Accounting, massive amounts of life changing environmental decisions could be made. Somehow because accountants are trusted by stakeholders to handle accounting information they tend to be selfish and withhold crucial information for environmental management.

Empirical evidence acknowledges that there is a need to equip accountants with environmental, accounting and sustainability education for them to easily adapt to the new wave of environmental reporting. EMA is a multi-disciplinary area which requires experts from different fields to work together and make sense of Environmental Management Accounting information. If these experts could agree and educate people who could embrace all angles of accounting and environmental information, a new breed of environmental management accountants could be birthed to take Environmental Management Accounting a step ahead.

The 21st century saw the role of accountants broadening from merely managing financial data to performance management within organisations. In the recent past accountants were involved in the recording of business transactions, collecting and collating information only. Now they have to make sense of information, propose better ways of managing information data bases, produce relevant different types of reports which match various stakeholders in financial as well as non-financial terms. They should be better communicators and strategists who are able to shape the direction of the company. They should be concerned with the information they produce because it indicates the direction the company will be taking. An over sight of important aspects of information collected will see companies facing imminent collapse. The monetary information produced should not only be historic but future oriented too, especially when it comes to EMA information. This is a major shift from the past where accountants were expected to report historic information and compare the trends, identify areas with major variances and take corrective actions. Extant literature shows that accounting information should be future oriented and informed by past experience to improve future decisions.

Accountants engage in sustainability accounting in three possible ways. They either involve themselves in adaptive engagement, constructive engagement or defensive engagement. The defensive involvement is the first possible reaction pattern of accountants. This relates to the strict gate keeping role of accountants. Accountants focus on selectively providing sustainability information to decision makers. It has been empirically observed that accountants do that for fear of losing power in organisational structures. The defensive strategy tends to work for a limited time and is usually used when power structures within an organisation are threatened. The second reaction pattern, adaptive involvement, encompasses the need for accountants to translate sustainability information into a language that is understandable for decision making purposes. Accountants communicate the information they receive in management terms. The accountants are willing to contribute towards the overall performance of the company and achieve strategic and operational goal. The third pattern is constructive involvement. In this involvement accountants are interested in the sustainability accounting process but they lack expertise which makes them act as mediators in

sustainability information management. Accountants in this role acknowledge the importance of sustainability information and the deficiencies in the communication of the information and try to support overcoming these information deficiencies in their limited scope of expertise. A decision not to actively engage in sustainability accounting by accountants was highlighted in empirical evidence given by Schaltegger & Zvezdov (2015) as the major type of defensive and adaptive involvement of accountants in sustainability issues. However, accountants play a pivotal role in sustainability accounting by developing and engaging with other professionals in implementing sustainability accounting (Schaltegger & Zvezdov, 2015).

2.4. Institutional Theories Surrounding EMA Developments and Implementation

Various authors put forward theories in an attempt to explain the reasons behind the adoption of Environmental Management Accounting information (Jamil *et al.*, 2015; Qian, Burritt & Chen, 2015; Qian, Burritt & Monroe, 2011). These theories were further backed up by empirical evidence which proved to some extent that the theories are somehow true in reflecting the adoption of Environmental Management Accounting by companies. The major institutional theories put forward were the coercive theories, cognitive theories and normative theories. These theories help in shaping EMA developments and trying to achieve a balance between different reasons why companies are motivated to implement EMA systems. Institutional theory is on its own another theory that views the organisation as part of the larger social system in which it operates. The theory stands out in explaining environmental management and Environmental Management Accounting in organisations. These theories will be explained in the next sections and their application to this research.

2.4.1. Coercive institutional theory

Coercive institutional theory makes use of force to make people adopt Environmental Management Accounting systems. The force can be in the form of regulatory requirements. These are environmental laws which should be complied with before an operational licence can be issued. Breach of these might mean losing a licence, reputational damage, or payment of penalties or shutting down of the company. These regulations usually come from the government or regulatory bodies. In Zimbabwe the coercive forces may be through the Environmental Management Agency of Zimbabwe (EMAZ) or the Ministry of Environment Water and Climate. The regulatory bodies may be in the form of, for example, POTRAZ in the telecommunication sector which levies heavy penalties of compliance and heavy operational fees, ZMDC in the mining sector, and EMAZ which operationalises the environmental laws in Zimbabwe. The other coercive institutions may be in the

form of pressure groups. These are institutions which fight for the adoption of human rights on behalf of the communities. The pressure groups in most cases work in isolation from the government but with non-governmental organisations. The pressure groups can cause irreparable damage to the reputation of the operating companies and in some instances they can take environmental issues to court and fight for the closure of companies who do not respect the environmental issues they fight for. Qian. *et al.*, (2015) state that coercive pressures come from different sources, among them is the government, regulatory bodies, licenced authorities or dependency based bodies such as parent companies.

Companies in different economic sectors are quick to respond to the coercive forces for fear of closing or reputation damage. Literature reveals that the coercive institutional theory is the fastest way that motivates companies to develop environmental management systems for fear of various reasons. The regulatory bodies should possess enough power to direct companies to act in a certain way. These coercive forces in some instances do not encourage a win-win situation between the companies and regulatory bodies. They need compliance even if it is against economic growth. Some companies end up shutting down because of compliance challenges. The coercive institutional force is believed to be the top driver of the adoption of EMA all over the world.

Contingency theory is a strategic management-based theory which contends that organisations are driven by task performance. It explains variations and diversity of management accounting practices. The need for survival and adaptation brought about the contingency theory which is closely aligned to the coercive institutional theory. In these theories contingency measures are taken to ensure strategically the survival of the company from different pressures, be it legal, environmental pressures or social environmental pressures. Organisations may be pressed to change their accounting systems (coercive force) by their institutional environment, but their own strategic priorities could influence the level of Environmental Management Accounting. That is the level of adoption.

2.4.2. Cognitive institutional theory

These are values respected within a certain profession or trade. Some companies who adopted this theory will not trade with another company unless environmental reports are first produced. This theory is applied in many economic sectors, especially mining, in which the industry self regulates in most instances and requires companies to comply with different types of certification, for example the international Kimberly process diamond certification in order to trade and show that the diamonds are clean (Robb Jr, 2012). Some lucrative green trading markets are open only if you have environmental certification like the ISO14001. This cognition or the need to be working well with others in the markets motivates companies to adopt the EMA initiatives.

Closely aligned to the cognitive institutional theory is the stakeholder theory. Many studies favour this theory to explain the relationship between environmental reporting and environmental audits. This is basically to favour the adoption of Environmental Management Accounting systems (Qian, Burritt & Monroe, 2011). Stakeholder's theory highlights the relationship and communication between an organisation and stakeholders. These are different stakeholders like the business partners, the trading markets, the government, pressure groups, customers, suppliers and licencing bodies.

The cognitive pressure is referred to as 'mimetic pressures' by Jamil *et al.,* (2015). These are responses of a firm to proven techniques or practices of competing firms when faced with ambiguous and uncertain situations. The uncertain situations might be to comply with the ISO14001 requirements. Companies end up complying in order to remain competitive and viable within the business or area of trade.

2.4.3. Normative institutional theory

Normative institutional theories make use of the norms and values of a society within which businesses operate (Jamil *et al.,* 2015). These norms are held dear by the communities around businesses. For the purposes of survival, businesses tend to take cognisance of these values and norms. Failure to take these into consideration may cause considerable damage to the company. The normative institutions strike a balance between the positive impacts of coercive and cognitive theories in EMA developments (Qian *et al.*, 2015).

Normative institutions take note of the role of preferred and desirable expectations or norms in influencing behaviour. Usually these norms and values are unspoken and have been morally governed or internalised. Companies usually rise up to the expectations and hence management perceptions about public opinion on sustainability influence organisational activities as well as management activities which may potentially encourage the adoption of EMA. In some instances the expected values and norms have been known to resist change within organisations.

The normative institutional theory is closely aligned to the legitimacy theory framework which suggests that companies operate with society's permission and their business actions seek to legitimise their operational existence (Alewine, 2010). The operational existence of the company should be in line with the society requirements. The theory is cited as one of the motivations behind the adoption of Environmental Management Accounting in different companies. Management ends up disclosing (or not disclosing) environmental information. Qian *et al.,* (2011) further states that legitimacy theory at its simplest emphasises that an organisation's activities should be in line with social values in the broad social system. These are expectation of society in general (Qian *et al*., 2011) which shape the adoption of Environmental Management Accounting practices.

2.5 Benefits of Environmental Management Accounting

There has been an underestimation of the poor environmental cost in various organisations (UNDSD, 2003). According to (Ferreira *et al.*, 2010), EMA's main objective is providing the physical information on how materials and energy are used, and financial information on costs, earnings and savings related to the environment. When companies implement EMA, there is a high possibility that cost saving opportunities or value creating opportunities may arise within the companies' present activities (Burritt & Saka, 2005; Christ & Burritt, 2012; Gale, 2006b; Jasch, 2006b). According to UNDSD, (2003), organisations can realise both financial and environmental management benefits. Gale (2006a) indicated that EMA has the probability of becoming a "reflexive modernisation strategy" in cleaner production. Energy, raw materials and waste can be precisely tracked and managed through the use of EMA (UNDSD, 2003). Costs of wasted raw materials and of waste streams management can also be correctly identified and estimated as well as managed (UNDSD, 2003). Jasch (2006b) indicated that EMA helps in convincing the finance department of an organisation to invest in environmental management through integrating the human resources and the prevention technologies.

2.5.1. Decision-making

Implementation of EMA helps in improving decision making (Ferreira *et al.*, 2010; Jasch, 2006a, 2006b; Kurniati, Rahadi, & Danial., 2010; Savage & Jasch, 2005). Using EMA is advantageous as Kurniati *et al.*, (2010) stated that it helps in the integration of the organisation's environment into management accounting and the decision making process. Still on the issue of decision making, (IFAC, 2005) indicated that EMA is not only essential for environmental management decisions but also for all management activities. EMA provides project managers and support line managers with basic information to formulate environmental prevention objectives and programmes (Jasch, 2006c). Better informed decisions can be obtained through the use of EMA leading to the flow of economic benefits (Ferreira *et al.*, 2010). Ferreira *et al.*, (2010) pointed out that sustainable reports produced by organisations that implement EMA lead to the development of better internal control systems and improved decision making. Implementation of EMA also assists managers on decisions about acceptance, and design or rejection of products/ procedures (Xiaomei, 2004).

2.5.2. Regulatory compliance

IFAC (2005) pointed out that, through using EMA, the organisations can protect the environment through cost-efficient compliance with regulations and policies pertaining to the environment. This can be done through planning and implementation of investments to control pollution; searching and

buying economical toxic material substitutes; and informing regulatory authorities when there are emissions as well as environmental waste (IFAC, 2005). EMA implementation contributes to organisations that use it through helping them to identify ways of cutting down regulatory compliance costs as well as operation costs (Xiaomei, 2004).

2.5.3. Strategic position and corporate image

EMA is a tool that helps organisations to evaluate and implement programmes that are environmentally sensitive as well as cost-effective which lead to the organisation's long-lasting strategic position (IFAC, 2005). This can be achieved through liaising with their suppliers to make products/services that are suitable for 'green' markets. According to Ferreira *et al.*, (2010), when organisations show good citizenship conduct and offer ecologically friendly products, they improve their corporate image. The organisations can estimate what the costs of anticipated future regulations could be and make reports to their stakeholders (customers, local communities, employees, government, environmental organisations and investors) to ensure they are strategically positioned on a long-term basis.(UNDSD, 2003; IFAC, 2005).

Ferreira *et al.*, (2010); Kurniati *et al.*, (2010) and UNDSD (2003) stated that using EMA can benefit organisations to improve their corporate image, to have enriched relations with their stakeholders and to minimise risk brought about by customer boycotts through delivering information on environmental, financial and social issues. This is important because environmental information allows stakeholders to make an assessment of the organisation's environmental performance, thus giving them opportunities to know how the organisation carries out its activities (Ferreira *et al.*, 2010).

2.5.4. Innovation and eco-efficiency

Ferreira *et al.*, (2010) indicated that using EMA leads to an increase in innovation but they went on to say that there was not enough evidence to support this. Their study pointed out that using EMA has a favourable connection to process innovation and not to product innovation, denoting that this EMA system can lead to realisation of economic benefits and at the same time improving environmental performance. According to Xiaomei (2004), enhancement of product design, process of production and packaging of the product through implementing EMA has led to a decrease in the environmental impact while at the same time refining the organisation's ability to compete and to have long term profits. EMA implementation can also assist many companies to see that they are responsible for the environment and by so doing they may identify joint economic and environmental benefits from business activities (Ferreira *et al.*, 2010). As organisations that implement EMA try to accomplish sustainable practices in addition to eco-efficiency, they are led to the development of new

products as well as to improving their current processes which in turn reduce resource use and environmental impairment caused by these organisations' activities. As stated by Gale (2006a), EMA is relevant to eco-efficiency which is one and the same thing as waste management and waste reduction.

2.5.5. Benefits to the government

There are also benefits that the government can obtain when companies implement EMA. The following benefits of EMA use by businesses to the government were stated by UNDSD (2003) as follows: data obtained from the EMA industry can be used for national-level accounting purposes and help the government to design policies; data obtained from the EMA industry can also assist in the estimation and reporting of the environmental performance regulated companies; when industries implement EMA, the effectiveness of regulations can be enhanced as they make known to the companies the environmental costs and benefits brought about by these regulations; and political and financial burdens pertaining to the protection of the environment on the government are reduced.

Using EMA has the ability to help organisations identify risks associated with the environment so as to come up with counter measures where it is impossible to have insurance or come up with the right methods to save insurance costs (Jasch, 2006c).

2.5.6. Profit margin and market share increase

When EMA is used by organisations, the organisation's environmental performance can be optimised as profit margins and market share are increased through the identification and reduction of the environmental costs (Kurniati *et al.,* 2010). Kurniati *et al.,* (2010) said that the internal management can gather and analyse environmental related financial information. EMA helps organisations to manage product responsibility properly through cost reduction leading to low risk as well as to resource and power saving (Xiaomei, 2004).

Murauer Bier, a brewing company in Austria, implemented EMA and realised remarkable benefits. According to (UNDSD, 2003), this company used cost accounting and materials accounting information to compute waste generation costs including the value of raw materials lost as waste and how much waste disposal cost. The company reduced fresh water per unit product by a percentage of 19, fuel oil usage per unit product by a percentage of 30, and wastewater per unit product by a percentage of 32 leading to an approximation of $186 000 savings (UNDSD, 2003).

Other benefits of using EMA by Ferreira *et al.,* (2010) include reduction of insurance cost, reduction of operating cost, increase in customer contentment, capital cost reduction, identification and attraction of exceptional staff, and increase in demand for green products. According to Xiaomei

(2004), EMA contributes positively to both human and natural environments as environmental costs are properly managed.

2.6 Challenges of Environmental Management Accounting

There has been a widespread record of the challenges of implementing EMA in different sectors of the economy. The mining sector is also on record for possessing peculiar challenges which are different from other sectors of the economy (Humphreys, 2001; Figueroa & Calfucura, 2004; IFAC, 2005; Kumah, 2006; Sarrasin, 2006; Ambe, 2007; Figueroa, Orihuela & Calfucura, 2010; Robb Jr, 2012; Bebbington, 2014;Moran *et al.*, 2014). Listed in the next few sections are some of the challenges experienced in the development and implementation of Environmental Management Accounting in different companies all over the world.

2.6.1. Poor communication links between accounting personnel and other departments

Human resources of different departments in an organisation have different information concerning their respective departments. According to Savage & Jasch (2005) the technical and environmental staff mostly have the information concerning how energy, water and other raw materials flow within the organisation but they do not know how these can be actually reflected in the records of accounts. On the other hand, the accounting staff might have accounting information but with slight information concerning the organisation's environmental matters nor the flow of physical resources (IFAC, 2005; United Nations, 2001a). This leads to the accounting staff not providing the type of accounting information that environmental and other technical staff may find very valuable (IFAC, 2005). According to Savage & Jasch (2005), the personnel in these different departments usually use information systems which are different and these are not usually checked for uniformity. Savage & Jasch (2005) further expanded that in cases where there may be consistency checks, these checks are usually challenging or impossible as these different information systems will be using dissimilar boundaries to track materials. All this makes implementing EMA very challenging due to language differences in the accounting and environmental staff's principles. Savage & Jasch (2005) also indicated that each department may be having different objectives and views concerning EMA activities. Ambe (2007) study indicated that it is difficult to form a common understanding between financial and environmental staff which makes it a challenge to implement EMA.

There is need for a dialogue between the accountants and technical and environmental personnel to address the environmental challenges. The dialogue ensures that environmental professionals in charge of physical data work hand in glove with accountants in charge of monetary data. The combination of monetary and physical data will enable organisations to respond to environmental

challenges by coming up with environmental management strategies informed by the monetary and physical data. Unless the gap between environmental, technical and accounting personnel is addressed, environmental performance management will remain a challenging task (IFAC, 2005).

2.6.2. Incomplete information management

Decisions by management concerning issues pertaining to investment projects and product pricing as well as product mix are affected when environmental information is unavailable (IFAC, 2005). The availability of proper environmental information ensures the quality of environmental decisions by management. Environmental information can be available only if the company is aware of how to account for environmental impacts in monetary and physical terms. This helps efficient product pricing and engagement in capital investment decisions.

2.6.3. Hiding environmental related costs in overhead accounts

There are very crucial environment-related costs that are always hidden in the overhead accounts instead of being recorded under processes/products that created these costs (IFAC, 2005). This is as a result of the fact that accountants are usually not aware of the environmental issues in the organisation, so there is a tendency of finding environmental costs hidden in the general overhead accounts (Alewine, 2010; Ambe, 2007; Christ & Burritt, 2012; IFAC, 2011; Jasch, 2006b; Qian *et al*., 2015; Qian *at al*., 2011; United Nations, 2001a, 2001b). The environment related costs are usually assigned to overhead accounts rather than directly to the products or processes that create them (United Nations, 2001a). This creates a problem in the costing of the products where you find products undervalued or overvalued because of improper cost allocations (United Nations, 2001a). Although environment-related costs are relatively significant, they are usually absent from the accounting records (IFAC, 2005). Other less tangible environmental related costs may also be absent from these accounting records (for example, lost sales due to poor environmental performance, or lost access to markets with environmental related product restrictions).

2.6.4. Accounting systems challenges

Accounting as a central information system for the company is recognised as an approach for tackling Environmental Management Accounting challenges (Schaltegger & Zvezdov, 2015). This is in contrast with Deegan (2013) who indicated that accounting information systems are the major challenge to the implementation and development of EMA systems. The accounting systems need to be changed in order to address EMA challenges. EMA cannot operate in the same systems conventional management accounting systems operate. This challenge is broadly categorised under

accounting systems challenges (Dumay *et al*, 2016). The medieval Debits and Credits of accounting seem not to work in Environmental Management Accounting in which the debits and credits are not available (Deegan, 2013; Gray, 2013). Deegan (2013) pointed out that the major challenge of EMA lies in the accounting framework in which it was developed. The principles and conventions in the accounting framework by their nature do not promote the development of EMA systems, for example, the matching concept, entity principle, materiality concept and the well-entrenched double entry concept.

In addition to the above challenges Ambe (2007) indicated, the fact that current costing systems are *ad hoc* somehow makes EMA a challenges because there is lack of consistency in information gathering. To illustrate the disadvantage of *ad hoc* information, Burritt *et al*., (2002) developed a framework which recognises that decision making varies in terms of type of data (monetary or physical), scope (past or future), range (short or long run) and periodicity (regular or *ad hoc*) of the information gathered. The periodicity of data gathering and reporting is an issue of concern as some data are gathered on a regular basis for operational control and periodically reported to different managers, while other data are gathered on an *ad hoc* basis for specific decisions, such as capital investment decisions which have environmental impacts (*Burritt et al*., 2002). Environmental Management Accounting information should be collected on a regular basis in order to obtain sufficient information for decision making purposes.

2.6.5. Inadequate tracking of information concerning material use, flow and financing

Savage & Jasch (2005) noted that large amounts of data are generated every year by organisations but there is still insufficient information concerning environmental decision making purposes. The potential benefits of EMA are not necessarily readily apparent. Therefore, there is lack of organisational incentives to advance environmental accounting (United Nations, 2001a). Few companies are in a position to access information on their environmental costs, liabilities and benefits or even to disclose such information in their annual reports (Ambe, 2007). This is a major challenge in EMA development.

Financing of the Environmental Management Accounting systems has been taken as a huge challenge, especially when you consider the amount of clean-up costs related to environmental impacts by companies. Most companies claim responsibility for environmental damages but they simply claim inability to finance the clean-up costs (Murombo, 2013). This poses a challenge as to whether companies will have enough money saved up for the “super funds” which take care of environmental rehabilitation after the mining activities are done.

2.6.6 Perceptions of the challenges facing the implementation of EMA

Perception of the challenges facing the implementation of EMA in South Africa are provided by Ambe (2007) as follows:

Table 2.4 Perception of the challenges facing the implementation of EMA

1. Establishing mutual understanding between environmental and financial practitioners
2. Political and Government buy-in required
3. Management and other stakeholder buy-in required
4. Communication gap between environmentalists and financial practitioners to be bridged
5. Resistance to change – human nature
6. Availability of funds
7. Tax relief, legislation and compliance – to be negotiated and legislated
8. Public awareness and education issues
9. Negotiation and definition of standards

Source: Ambe (2007)

2.7 Summary and Deductions

The first section of the literature review looked at Environmental Management Accounting in general. Many definitions from academics and professional organisations have been put forward in order to understand the different complexities of Environmental Management Accounting. The United Nations definition was adopted for the purpose of this study because of its ability to reduce environmental costs to day-to-day business operations. The link between sustainability in general and Environmental Management Accounting was established. This was done in order to find out if there is evidence in the literature which links Environmental Management Accounting to sustainability. The literature review shows that there are links between sustainability and EMA. The concept of sustainable development brought EMA to life. In this review institutional theories surrounding the adoption of EMA by companies were discussed. These theories help in shaping the direction of the research in as far as the implementation of EMA is concerned in Zimbabwe. The chapter closed by looking at the possible benefits and challenges of EMA. It is evident from literature that the benefits of EMA outweigh the challenges of implementing EMA. The next section will examine how the government of Zimbabwe regulates the mining sector. This entails looking at the legal regulatory framework as well as the accounting regulatory framework.

CHAPTER 3
EMA REGULATORY FRAMEWORK

3.0. Introduction

The third Chapter touches on the regulatory framework within which the extractive industry operates. There are divergent views on the regulation of Environmental Management Accounting coming from the traditional accounting point of view. The literature review indicates that government involvement in the extractive industry is very little and the regulation of the mining sector and extractive industry has been a contentious issue for decades. The chapter discusses the historic background of Zimbabwe, the country where the research was based. A discussion on aspects of the extractive industry and mining sector is given. Lastly, the chapter looks at the government and accounting regulation.

3.1. The Extractive Industry and Mining Sector Perspectives

The extractive Industry and mining sector of Zimbabwe contributes significantly to the economy of the country. The sector consists of about 89 mining companies. The Ministry of Mines and Mining Development manages the minerals sector in accordance with the Mines and Minerals Act (chapter 21:05), and the mining (general) regulations (1977) and their amendments. Mining operations are also regulated by sections of the Environmental Management Act of 2002 (chapter 20:27) and its 2007 amendment, the Explosives Act, the Forest Act, the Parks and Wildlife Act, the Public Health Act, and the Suppression of Money Laundering Act (Mobbs, 2014).According to Mobbs (2014) the most economically significant minerals in Zimbabwe are gold, diamonds and the platinum group minerals (PGMs). The state-owned Minerals Marketing Corporation of Zimbabwe (MMCZ) market most of the minerals produced in Zimbabwe (Mobbs, 2014).

The mining industry structure consists of domestic and international investment companies, domestic and international mining companies, Government owned mining companies, mining cooperatives, multinational cement companies, and small-scale miners managed mineral operations in Zimbabwe. Ownership of mineral operations by domestic and international non-indigenous companies or people is limited by statute. State owned companies involved in the mining sector are MMCZ, Zimbabwe Mining Development Corporation (ZMDC), and subsidiaries of the state-owned Industrial Development Corporation of Zimbabwe (IDCZ) Limited (Mobbs, 2014).

There are many processes in the mining industry. The mining process can be divided into four distinct phases: exploration; development and construction; production; and decommissioning and post

production activities (Sinding, 1999). The processes should be recorded in financial terms to have a true and fair view of the financial position of a company.

3.1.1. Types of mines

Zimbabwe consist of different types of mines which include open cast mines/surface mines and underground mines. Murowa Diamond is an example of a surface mine in Zimbabwe. Ngezi Mine is an example of an Open pit mine (Coakley, 2002). Hwange Colliery Company has a combination of both open cast mines and underground mines (Hwange Colliery Company Limited, 2014). There is an equal distribution of open cast mines and underground mining in Zimbabwe with most mines believed to be underground and in the gold mining industry.

The type of mines influences the level of environmental impacts. The consideration of the types of mines in Zimbabwe is important in shaping Environmental Management Accounting in Zimbabwe. Mining is a complex sector with different mining requirements from one mine to the other, with different environmental impacts. A critical look at the different types of mines helps in shaping the components and aspects of EMA in the mining sector. This helps to ensure that all elements of reporting in the mining sector are exhaustive. By elements we mean the peculiar environmental reporting aspects or, in accounting terms, peculiar ledger items to report on.

3.1.2. Mineral content

Zimbabwe boasts of its vast mineral content in comparison to the other countries all over the world. The country has more than 1000 mines and counting (Consisting of small scale mines and large mines), with over 60 minerals of which 40 of them have been exploited to date (Coakley, 2002). It is, however, not clear how much mineral content value is in Zimbabwe because the government has not invested much in finding out the value of the minerals in Zimbabwe. In the 2015 budget statement the minister set aside about $500 000 to cater for a mineral geological survey to ascertain the value of the minerals in Zimbabwe.

This is a step towards ensuring accountability to the environment and increasing sustainability of the sector. The knowledge of the value of the minerals in Zimbabwe can help the government to invest in areas such as EMA to ensure that environmental standardised reports are produced, but not only investments in the reporting aspects, but the actual implementation of EMA as well in an effort to improve environmental performance which ensures a win-win situation for both the companies and different stakeholders.

The sector at one point was a major contributor to the world supply of chrysotile asbestos, ferrochromium and lithium minerals among other minerals. Many minerals are found in Zimbabwe which include diamond, gold, platinum and chrome; these minerals are found in large quantities.

3.1.3. Revenue contribution of the sector

The mining sector makes the highest contribution to the government revenue (Chigumira, 2014). With mining sector state-owned enterprises and parastatal GDP contribution of 0.9 percent (The World Bank, 2017). The mining sector used to be the largest export earner after agriculture in 2002. As of 2014 the agricultural sector deteriorated and now the mining sector is the largest export earner.

The major minerals which are contributing positively are the diamond, gold and platinum industries. The contributions of these sectors help to narrow our research to the industries which are performing well with capacity to implement EMA.

The sector contributes revenue through corporate taxes and royalties paid by the sector to the government. ZIMRA manages these revenues. There are many fees which are also paid to the government, for example, mining licence fees. Tax revenues generated from mineral production are available to fund education, health care, electricity supply, roads and other growth-enhancing infrastructure development (Chigumira, 2014).

Mineral production in Zimbabwe contributes income and foreign exchange through exports, and can help the local economies grow through the purchase of local inputs. The World Bank projects the value of mineral production to increase from 2.1 billion in 2012 to 8 billion by 2018. Figure 3.1 below shows the value of mineral output from 1980-2012. The chamber of mines indicated that of the $2 billion revenue generated by the mining sector in 2012, 39 percent benefitted suppliers, materials and consumables; 19 percent benefitted workers in the form of salaries and wages; 14 percent benefitted other operating expenditures; 17 percent was paid out to government in form of taxes and other related fees; and 11 percent represented average profit after tax. The Zimbabwean mining sector is currently contributing 15 percent of nominal GDP; 58 percent of total exports; 13 percent of fiscal revenue; more than 45 000 jobs; and more than 50 percent of foreign direct investments. There has been a phenomenal increase in mining contribution to national income from an average of 7 percent in the 1990s to as high as 20 percent in 2015 (Chigumira, 2014).

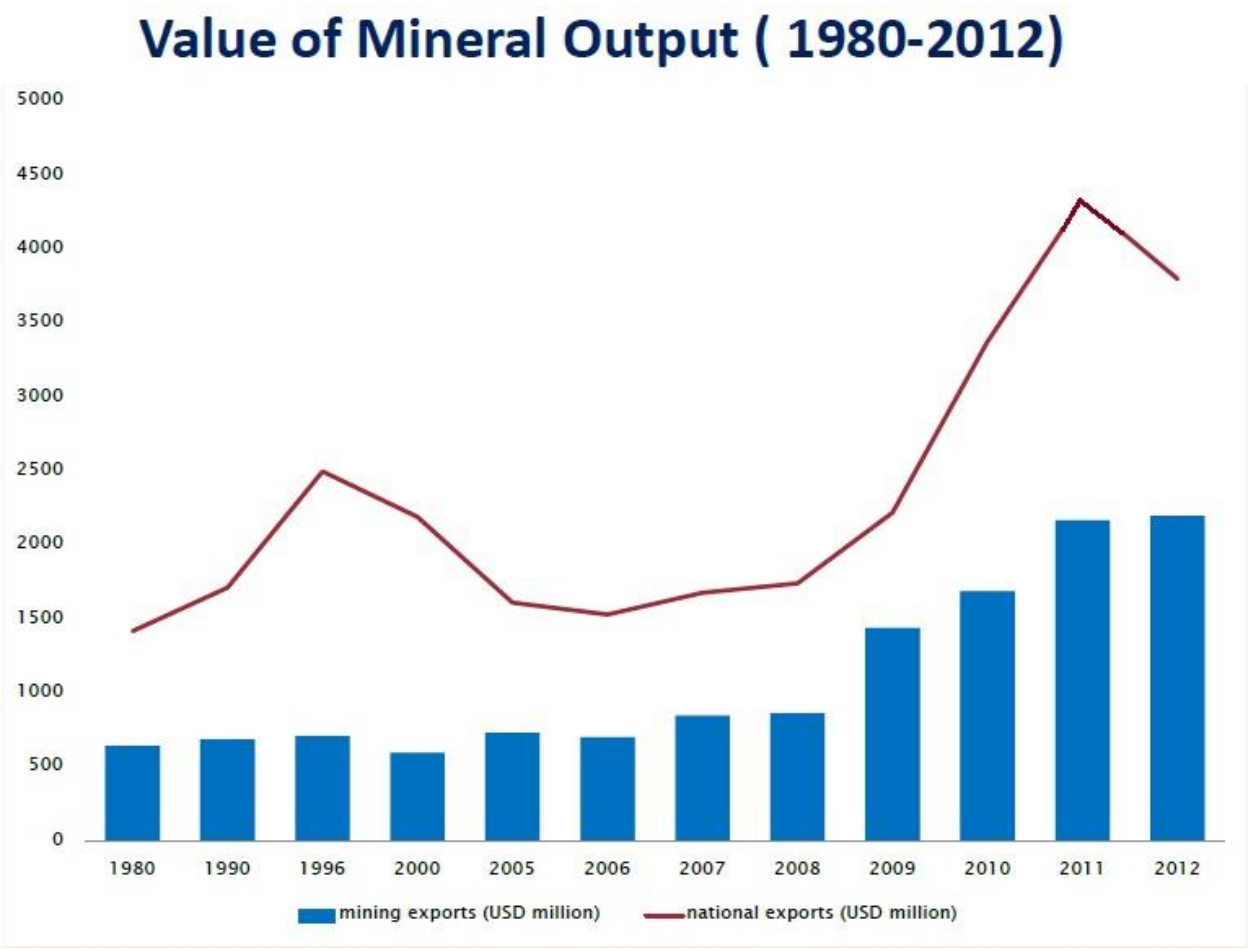

Figure 3.1 Value of mineral output (1980 – 2012)

Source: ZIMSTATS (2012)

3.1.4. Geographical spread of the mining companies

Zimbabwe as a whole is dotted with minerals and in almost every province of Zimbabwe there are minerals and companies exploiting those mineral resources. The map below (Figure 3.2) shows how widespread the mineral industry is in Zimbabwe. Most of the mining companies have their head offices in Harare, the capital city of Zimbabwe. This makes the research easy to conduct and to reach many companies in one city through their head offices.

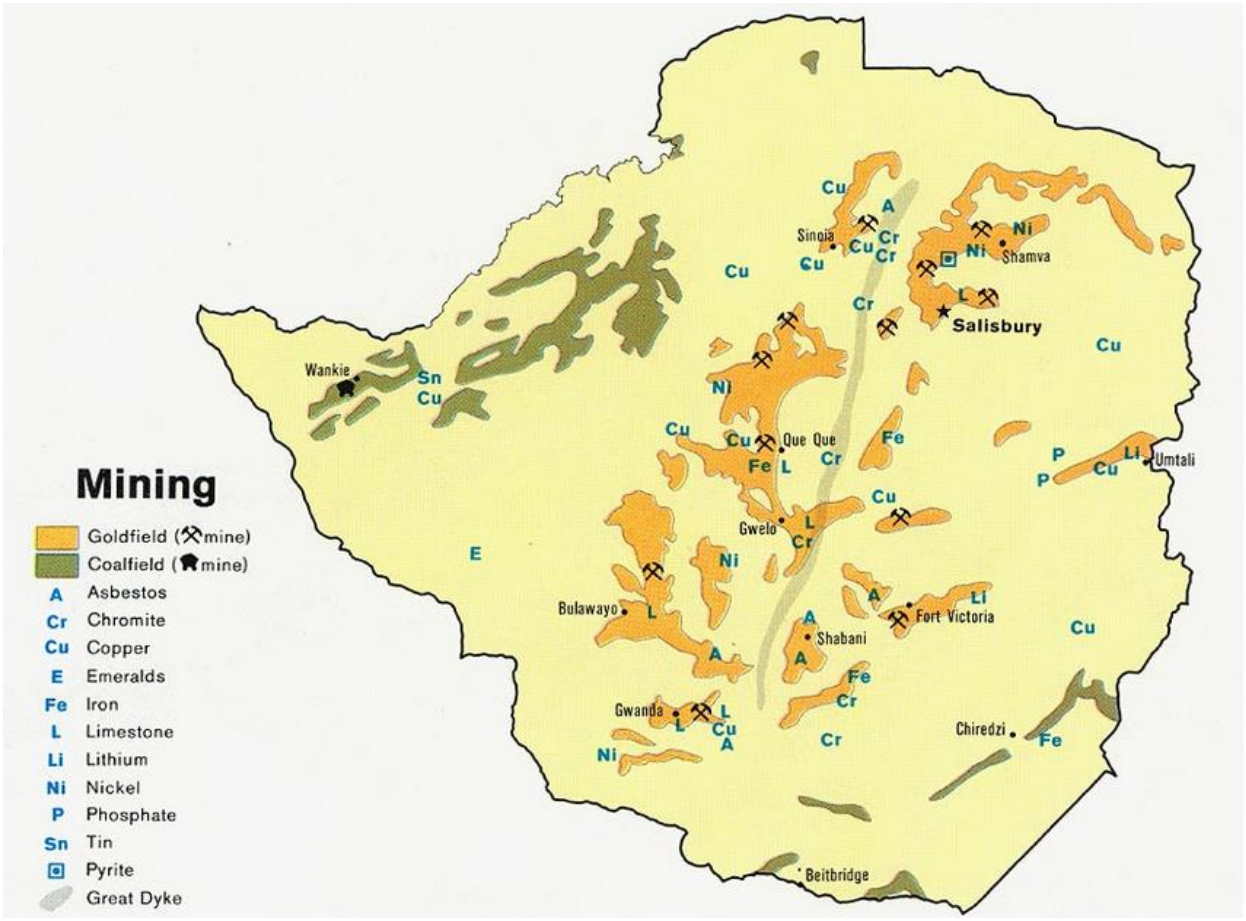

Figure 3.2 Mining activities across Zimbabwe provinces

Source: Surveyor General (2013)

It is clearly evident from the map that mining is one of the major industries in Zimbabwe and is spread all over the country. This can suggest massive output from those sectors. The map can also suggest unbearable environmental impacts if the mining sector is not properly regulated in terms of the environment and the accounting systems. Hence, the need to properly look at EMA in the mining sector in order to or with the idea of reducing the environmental impacts. It can be envisaged that if the environmental aspect of EMA is not properly considered and effected Zimbabwe could be reduced to a land of gullies and rubbles by the end of the exploration activities. The mining companies should somehow be accountable for their environmental actions and should be in a position to record their environmental impacts be they positive or negative. This is the point where EMA comes into play to help organisations so that they can benefit by implementing EMA rather than sacrificing their hard earned profits.

3.2. Government of Zimbabwe's Regulation of Mining

Zimbabwe is a country in Southern Africa with ten provinces and rich mineral deposits (more than 60 different types of minerals, 40 of which have been exploited at one point or another (Coakley,

2002)) ranging from diamonds gold, platinum group metals, copper, nickel, coal, chromium ore, vanadium, lithium to tin. The country is governed by a democratic government which consist of 26 ministries, among them the Ministry of Mines and Mining Development and the Ministry of Environment, Water and Climate which are of paramount importance to this research (Government of Zimbabwe, 2015a). The Ministry of Mines and Mining Development oversees the Chamber of Mines of Zimbabwe (COMZ), Zimbabwe Minerals and Marketing Corporation (ZMMC) and Zimbabwe Mining Development Corporation (ZMDC). ZMMC was established in 1983 to market and sell minerals produced in Zimbabwe. ZMDC was established by an act of parliament in 1982 to oversee and invest in the mining industry of Zimbabwe on behalf of the state (ZMDC, 2012).

The Chamber of Mines of Zimbabwe (COMZ) plays an important role in the extractive industries and mining sector of Zimbabwe. COMZ is a private sector voluntary organisation established in 1939 by an act of parliament. The mining company members of COMZ produce 90 percent of Zimbabwe's total mineral output, indicating that the organisation plays a pivotal role in Zimbabwe's economy. The major objective of the organisation is to promote the interests of the mining industry in Zimbabwe. The researcher believes that EMA is of interest to the COMZ. The views of the industry are presented to government by the COMZ.

Zimbabwe's economy depends heavily on the mining and agricultural sector (Robb Jr, 2012). The mining sector is currently the backbone of the nation's economy and continues to make significant contributions to the country's export earnings, accounting for 52 percent, followed by agriculture accounting for 21 percent, manufacturing 13 percent, and services 11 percent as of December 2014 (Government of Zimbabwe, 2015b). The total receipts of exports realised in 2014 amounted to US$2.4 billion (Government of Zimbabwe, 2015b). The GDP growth estimates in mining and quarrying industry were estimated to grow from -2.1 percent in 2014 to 3.1 percent in 2015 (Government of Zimbabwe, 2015b). Madziva (2014) and Ofosu-Amaah (2012) further indicated that the mining sector is the fastest growing sector in Zimbabwe with an average annualised growth rate of 40% and contributing 47% to the GDP.

All hopes of economic recovery are being placed on the mining sector, specifically diamond mining. Marange diamond fields is one of the largest diamond reserves in the world (Robb Jr, 2012). Though the diamond mining will not help with full economy recovery, revenue obtained from the sector will be used to reinvest in other economic sectors like agriculture and manufacturing to provide long term sustainability (Robb Jr, 2012).

There is enough evidence in the literature to indicate that Environmental Management Accounting is being practiced in Zimbabwe (Ambe, 2007; United Nations, 2001b). What is not clear is the level of

implementation and its impact on the sustainability of the sector as there has not been any empirical research done on the impact of Environmental Management Accounting in the Zimbabwean mining sector.

3.2.1. Environmental Management Agents of Zimbabwe (EMAZ)

The Environmental Management Agency of Zimbabwe (EMAZ) is a statutory board responsible for ensuring the sustainable management of natural resources and protection of the environment, prevention of pollution and environmental degradation, and the preparation of environmental plans for the management and protection of the environment. EMAZ was established under the Environmental Management Act [Chapter 20:27] and operationalised in 2003.

The organisation should spearhead the implementation of EMA in the country. This has been the case in many countries who are implementing EMA. The environmental agencies were in the forefront of developing guidelines and frameworks for the implantation of EMA on behalf of the government, for example, the United States Environmental Protection Agency (USEPA) and the Japan Environmental Protection Agency (JEPA) (Bebbington & Gray, 2001; IFAC, 2005). The government agent usually work with international organisations like the United Nations Environmental Protection (UNEP) agency to find ways of reducing environmental pollution.

It is imperative to state that that if EMA is going to be effectively applied by the government. EMAZ should take a leading role in the development and implementation of Environmental Management Accounting. The enforcement of environmental protection should fall under the ambit of EMAZ as literature shows in other countries. The agency falls under the Ministry of Environment, Water and Climate change.

3.2.2. Two crucial ministries in EMA development and regulation

The Ministry of Environment, Water and Climate regulates the management of the environment through the EMAZ. The ministry has the overall responsibility of coming up with environmental initiatives. Internationally, ministries of environment are crucial in spearheading Environmental Management Accounting, for example the Japan Ministry of Environment came up with Environmental Management Accounting Guidelines for Japan (IFAC, 2005).

The Ministry of Mines and Mining Development manages the mineral sector in accordance with the Mines and Minerals Act, Mining General Regulations (Robb Jr, 2012). Mining operations are also regulated by sections of the Environmental Management Act which is under the Ministry of Environment and Climate Change (Mobbs, 2012). This indicates how important the two ministries are to the development and implementation of EMA.

The two ministries ensure the proper regulation of the mining sector to reduce environmental impacts as well as to ensure transparency in the sector for economic growth. The ministries are involved in environmental protection programmes (for example, cleaner production, safe chemicals management) which are offered in coordination with the United Nations Environmental Protection Programmes. The government partner in Zimbabwe for cleaner production is the Ministry of Environment, Water and Climate Change and the Ministry of Environment and Tourism (United Nations, 2001a).

3.2.3. General regulation in the mining sector

To understand how the government of Zimbabwe currently regulates the mining sector it is very important to separate the sector into three entities of regulation which are the financial part composed of taxes or government imposed regulation (taxation regulation), the accounting regulation which is ordinarily governed by the accounting professions and the law regulations composed of different Acts (Acts and Statutes). The rationale for separating the taxation regulation from other related law regulations is because the government is more interested in benefits which accrue to the fiscus through tax revenue and tend to give more emphasis to proper taxation of the sector. The segmentation of the regulation section of this chapter helps in fully understanding the sector and how EMA may be enhanced through these separate areas of regulations. It is outside the scope of this research to critically look at the laws governing the mining sector though some insights will be shared in order to avoid overlooking some important issues of consideration in the implementation of EMA. The researcher has concentrated on the financial and accounting regulation in order to understand how EMA is being regulated in Zimbabwe.

3.2.3.1. Taxation regulation

There is a lot of evidence on financial regulation of the mining sector in Zimbabwe in terms of taxation laws (Dhliwayo, 2014; Government of Zimbabwe, 2015b; Robb Jr, 2012). There is limited understanding of the financial regulation of the mining sector outside the tax incentive and taxation in general. There is need to understand how the government of Zimbabwe regulates the mining sector in accounting and financial terms beyond the tax system. This includes the use and understanding of the accounting standards and how applicable they are to Zimbabwe. This understanding and regulation of the sector helps shape Environmental Management Accounting in the Zimbabwean mining sector.

The major drive of the taxation regulations in Zimbabwe is to curb the illicit financial flows rather than coming up with a system that is environmentally sensitive and at the same time improving environmental performance and business performance. The sector is on record for having high gaps

in financial flows. The government believes that the Zimbabwe revenue authority (ZIMRA) can play a crucial role in ensuring that all illegal revenue outflows are accounted for and reduced to a minimum. There are also concerns from the stakeholders in the sector whether the rate of tax in the sector is justifiable (Dhliwayo, 2014) which is in contrast to the general views that tax rates in the sector are low (Sinding, 1999). Zimbabwe mining sector tax rates are very high and discourage investment in the sector as well as development of environmentally sensitive initiatives. The government currently is concerned with the sector can contribute to the fiscus rather than development of sustainable systems which are beneficial to both the companies and the government in the long run. Other governments give tax incentives in the form of exemptions or other advantages for companies involved in environmental management (United Nations, 2001b). These tax exemptions should be calculated and included as cost savings in EMA arising from investments and projects.

EMA is also of use to tax agencies in achieving their major goal of ensuring that income is available to contribute towards public budgets (United Nations, 2001a). Mining taxation in Zimbabwe has not generated enough revenue for the fiscus, yet natural resources were being exported (Mtisi, Dhliwayo & Makore, 2011). Financial accounting in the sector is only used to assess the basis for benefits to shareholders (profits) and taxes to be remitted to the government (Jasch, 2006b). The next sub section will look at the accounting reporting regulations.

3.2.3.2. Accounting reporting regulation

Zimbabwe as a nation has not fully developed its national accounting standards which are peculiar and applicable to the Zimbabwean systems and operations. It is widely held that the accounting standards adopted as the national standards are the International Federation of Accountants (IFAC) and the International Accounting Standards Board (IASB) accounting standards which are the International Financial Reporting Standards (IFRs) together with the accompanying International Accounting Standards (IASs) and International Standards on Auditing (ISAs). This is evident in that the accounting mother board in Zimbabwe, the International Chartered Accountants Zimbabwe (ICAZ) currently is affiliated to the South African Institute of Chartered Accountants and all CA's produced in Zimbabwe are examined by the South African board through UNISA or SAICA. This is an indication that the country does not have a stand-alone national accounting standards. The CAs will, however, be designated (CA(Z)) to indicate they are from Zimbabwe. Though many companies use the IFAC, IFRs other companies are still using the British Generally Accepted Accounting Standards (GAAP). The rational for using different types of standards is not clear to the researcher and yet the accounts of the companies using different sets of standards are audited in most cases by

the big six accounting firms in Zimbabwe (PricewaterhouseCoopers, Ernst and Young, Deloitte and Touché, KPMG and Grant Thornton)

During the hyperinflation (rather the run-away inflation as it was called because of the high levels of inflation which was estimated to be over 79.6 billion percent in mid-November 2008), the national accounting board, Public Accountants and Auditors Board Zimbabwe (PAABZ) led companies on how to report in an hyper inflationary environment when it was difficult to include comparative years because the figures where ridiculously high in comparison to the previous year results. The PAABZ led the companies on how to apply the IAS in a hyperinflationary economy. This is the only period the accounting profession seriously engaged with industry to indicate how the companies produce their financial statements and how they will be audited. The hyperinflationary year was passed as an unaudited year.

The government regulates the production of financial statements by indicating that publicly listed companies should produce their financial statements annually for publication.

"*Companies ACT S141 (1) The directors of a company shall cause to be made out (Profit and loss account and balance sheet) in respect of every financial year of the company, and to be laid before the company at each annual general meeting required to be held in terms of section one hundred and twenty-four, a profit and loss account and a balance sheet as at the end of the financial year, which shall comply with section one hundred and forty-two*" (Companies Act, No. 47 of 1951, 1951).

This ensures transparency to the stakeholders. It is mandatory for these accounts to be in the public domain. The Companies Acts is clear on the annual or quarterly production of financial statements but does not categorically state how the accounts should be produced and following a set of which standards.

"*Companies ACT S141(2) Subject to subsection (1), a company's balance sheet and profit and loss or income and expenditure account shall comply with any requirements that may be prescribed in regulations in regard to their form and content and any additional information to be provided by way of notes. (The regulations are not specified which should be complied with, vague statement*)" (Companies Act, No. 47 of 1951, 1951).

The same principle applies in the mining sector. Publicly listed mining companies are required to produce financial statements for publications. However, there is no mention of producing environmental accounts though they are very important for the social wellbeing of the surrounding stakeholders. According to literature different stakeholders in the mining sector are interested in knowing the environmental impacts of companies operating within their surroundings. Though this

is not the only reason for producing EMA reports, the reports help companies to reduce and manage environmental impacts, thereby enhancing company performance in many ways.

The consideration of the standards to use in the production of financial statements or environmental reports lies with the scope of the mining companies themselves through their different finance manuals or policies. The companies determine which standards to adopt or not to but in line with international and national standards. These standards should comply in all material terms with international standards. This is illustrated by the following statement from the Companies ACT:

"*Companies ACT S142 (4) The Minister may, on the application or with the consent of a company's directors, modify in relation to that company any of the requirements of this Act as to the matters to be stated in a company's balance sheet or profit and loss account, Except the requirements of subsection (1), for the purpose of adapting them to the circumstances of the company. (Companies may apply to report on what they want which means applying for a waiver of any regulation and use their own finance manuals or policies to come up with the financial statements*)" (Companies Act, No. 47 of 1951, 1951).

The government of Zimbabwe does not delve into the specifics of how the financial statements should be produced which raises a question on how the accounting systems are being regulated by the government. It is not clear whether the country has the national accounting standards they follow or they just adopted the international accounting standards as they are. This lack of form or content of information to be disclosed in financial statements is typical of developing countries who in their company Law or Acts mention that the financial statements should comply with accounting standards though there is no mention of specific standards, be it the US GAAP or the IFRS (Al-Akra *et al*., 2009)

3.2.3.3. Acts and Statutes

The mining sector is largely regulated by the Zimbabwe Mines and Minerals Act (ZMMA) (Chapter 21:05) of 1961 among other Acts (Dhliwayo, 2014). There is a wide array of other laws which help in regulating the mining sector like the Administration of Trade and Dealing with Mineral Resources Act, Communal Lands Forest Produce Act as read with the Traditional Leaders Act and the Rural District Councils Act, Environmental Management Act, Indigenisation and Economic Empowerment Act, National Environmental Policy and Strategy of 2009, Environmental Management Regulations, Forest Act (Chibememe *et al.,* 2014). All these Acts work hand in glove to make mining sector regulation robust and all encompassing.

The ZMMA has been in the spotlight for several years with environmental pressure groups pushing for its amendment because it is old and aligned towards mineral extraction and not the sustainability part of it (Chibememe *et al*., 2014; Dhliwayo, 2014; Murombo, 2013; Robb Jr, 2012). A bill will soon be presented to parliament to replace the ZMMA with a new Act (Government of Zimbabwe, 2015b; Langa, 2015; Mushava, 2015).

In the volumes and magnitude of these Acts there are no regulations or Acts which are specific to sustainability accounting, which this author believes is crucial for shaping the sustainability of the sector beyond the profit and general environmental performance. There has not been any framework developed or regulations developed to look at possible avenues of accounting and reporting environmental costs and benefits.

3.2.3.4. Pressure groups

Pressure groups are a major contributor to the development of mining regulations in Zimbabwe. The pressure groups work in their own right and also represent the needs of the people who are affected by the operations of the mining companies in their communities. Environmental negative impacts hit hard on the communities surrounding the mining sites and those communities are helpless to do anything hence the pressure groups make it mandatory for the voices of the communities to be heard by the companies as well as the government.

The groups internationally are also working to ensure that EMA practices are taken seriously and implemented by companies with high environmental impacts. We have also some, like the Zimbabwe Revenue Transparency Initiatives (ZRTI) which are working to ensure that there is transparency in the mining sector. These initiatives were brought to life by the Minister of Finance because of their envisaged potential to contribute positively towards the development of a transparent accountability framework (Government of Zimbabwe, 2015b).

3.2.4. Governance of mines

The Ministry of Mines and Mining Development spearheads the development of mining regulations in collaboration with other ministries like the Environment Ministries and the justice and parliamentary affairs ministry (on the legal side). The governance of the mines entails things like the overall running of the mining sector, establishment of the operation procedures and the reporting structures in the sector.

The understanding of how the mining sector is governed or run help in focusing on the actual point where the need for implementing EMA in the sector can be directed. Governance can indicate whether

or not it is feasible to implement EMA and can also help in establishing the current state of the mining sector in as far as the implementation of EMA is concerned.

3.2.5. State owned mines vs private owned mines

The mining sector in Zimbabwe has been heavily politicised, that is, most companies in the sector are owned by politicians and act as political vehicles to spearhead the interests of political parties. Therefore, if the mining companies are owned by political parties it means the possibilities of change and implementation of EMA are far-fetched because their needs differ from the needs of the general populace and the international requirements of the GRI. Their mandate will be to ensure that they use mineral resources to cling to power and build their empires rather than to spearhead the needs of the country and the societies in which they are operating.

A political circle is always difficult to penetrate, hence the need to establish the number and amount of state owned mines versus private owned mines. State owned mines usually hide behind the politicians as much as the privately owned mines hide also behind the politicians. Though it is very important for mines to be owned by the state, to some extent in Africa the state-owned mines are run by the political parties usually in government.

In Zimbabwe, there are many parastatals which were established to oversee the running of the mining sector like the ZMDC, COMZ, and MMCZ. These parastatals are run by the government and have ownership in the mining sector. For example, the ZMDC owns more than 50 percent share of the mines in its control and invests on behalf of the government. The Indigenization and Economic Empowerment Act encourages ownership of the mines by the state. Currently the state owns about 50 percent of most companies in the mining sector under the guise of local people owning the 50 percent share.

The MMCZ identifies the marketing opportunities on behalf of the government. Fidelity Printers buys almost all the minerals produced in Zimbabwe on behalf of the government and identifies buyers abroad. This then means the government plays a big role in the mining industry, but the role can be seen as a political role to monopolise the minerals produced in Zimbabwe be it by public or private companies.

The Ministry of Mines and Mining Development is on record trying to ensure that diamond mining come together as one under the control of the government but this is facing resistance from unknown forces making it difficult for the government to run the companies in diamond mining. This compromised position in which the government is not able to control the companies in the mining sector somehow shows the political control of the mining sector, especially the diamond mining

industry. It is on record that Marange, one of the largest diamond mines in the world, is controlled by ZANU PF, a political party (Robb Jr, 2012).

3.2.6. Mining regulation in other African countries

African has a history of poor mining regulation which the multinationals exploit to their advantages (Tsamenyi *et al*., 2017). Many cases of blood diamonds and illegal mining are recorded in many African countries. In other case civil unrests are as a result of poorly regulated and managed mining. The rest of Africa remains poor although it has good mineral base "*the resource curse*" (Dhliwayo, 2014). History gives an account of how Africa was colonised. The main cause was the need to exploit the mineral resources which Africa as a continent possesses. Until recently Africa has not seen the need to properly craft and develop their own mining regulations. Most of the regulations being used in many countries in Africa were developed during the colonial period (Murombo, 2013). In spite of the fact that Africa as a whole has poor mining regulations, there are few examples of countries who are doing well in managing and regulating their mineral resources.

Botswana and South Africa give a good account of mining regulation in place which can benefit the entire country and its citizens. (Robb Jr, 2012) Botswana amended its mining regulations in the diamond industry and is doing very well with their diamond mining. South Africa recently changed its mining regulations to make it more effective and workable. These two examples indicate that mining regulation is crucial for the realisation of revenue in the sector to the government and the entire populace in terms of employment creation and general infrastructure development.

3.2.7. Specific accounting standards in use (international and national)

Accounting standards have been in use in the mining sector for year in the production of financial reports. The standards are general, though there are standards which are specific to the mining sector like the International Accounting Standard (IAS) 37, as read with International Financial Reporting Interpretations Committee (IFRIC) 1, Changes in existing decommissioning, restoration and similar liabilities. There are no specific national standards which are used in the mining sector. There are, however reporting guidelines in the production of environmental accounting reports. These were developed by the GRI, IIRC, IFAC as well as the United Nations (United Nations, 2001a, 2001b).

The other standards which the accounting profession depend on in environmental accounting reporting are the International Financial Reporting Standard (IFRS) 6 - exploration for and evaluation of mineral resources; and IFRS 5- Non-Current Assets held for sale and discontinued operations. These are used together with the IFRIC 5- Rights to interests arising from decommissioning, restoration and environmental rehabilitation funds. Many companies in the mining industry are more

concerned with fulfilling the requirements of IFRIC 5 by ensuring that they have the environmental rehabilitation funds. Governments all over the world are establishing the superfunds to help in environmental rehabilitation. This is the most common environmental initiative known in companies which have high environmental impacts. The companies usually create the provisions for rehabilitations funds through the help of IAS 37 (Kopperschaar *et al.*, 2014).

3.3. Importance of EMA in Different Sectors

The importance of EMA can never be over emphasised. It is very clear that EMA is very significant in all sectors of the economy. It is important at this stage to indicate the vital contributions of EMA in different sectors. The evidence was based on empirical research from other countries or companies which applied EMA systems in their organisations. Extant literature indicates that empirical evidence of Environmental Management Accounting is still sparse (Albelda, 2011). Though EMA applications may differ from organisation to organisation, it will give an idea of how EMA is impacting those organisations and in what ways. EMA has been applied largely in the manufacturing sector, the agricultural sector, small and medium enterprises and the service industry, and the mining sector and extractive industry to a lesser extent. This focus of this study is in line with the United Nations (2001a) who indicated that a sectorial focus can be an important part of EMA development and implementation because industry sectors have various types of materials and energy flows which may be subject to different types and magnitudes of environmental costs. In the next few sections below the study looks at how EMA has been conducted so as to shape the current research.

3.3.1. Manufacturing

Extensive research has been conducted in the manufacturing sector or industry focusing on Environmental Management Accounting and specifically the impact of company activities on environmental performance. The manufacturing sector has many environmental impacts which come from water, raw materials and pollution from manufacturing companies. Extant literature reviews targeted towards EMA for industry seem to be mostly focused on manufacturing, rather than resource extraction or the service industry (United Nations, 2001a).

Evidence gathered from six manufacturing eco-management and audit scheme (EMAS) registered factories indicated that the incorporation of environmental issues into management accounting practices increases the internal visibility and control of the environmental management and could lead to the improvement of environmental and economic performance. There were, however, no substantial changes to business priorities (Albelda, 2011).

The manufacturing industries helped EMA practitioners to understand that most environment related costs are hidden in overheads thus resulting in improper pricing strategies. The effort in current research is try to unbundle the overheads and allocate the costs to appropriate cost centres. The other industries are aware of the inherent weakness of the current traditional accounting systems which tend to hide environmental costs. This knowledge enables companies to come up with systems which are robust in articulating environmental impacts.

Many companies in the manufacturing industry have moved their production facilities offshore to countries such as China and Malaysia where costs of operation are low, for example no carbon taxes, lower electricity, cheap labour and other operating costs. This encourages some countries to export their pollution to other countries (Deegan, 2013). This means avoidance of implementing environmentally benign systems which are good for environmental performance as well as organisational performance. The avoidance method by multinationals has huge future implications in terms of sustainability.

3.3.2. Small and medium-sized enterprises (SMEs)

Coercion is a dominant factor in practicing EMA in SMEs in the manufacturing sector *(*Jamil *et al*., 2015). Most of the SME manufacturing firms acknowledge that environmental activities are vital for global sustainability in the future. The manufacturing SMEs indicated that the financial constraint is a barrier to the development of EMA coupled with an insufficient environmental knowledge (of the true costs and benefits of EMA), and skills to integrate environmental issues into the accounting systems and practices. The United Nations further supported this by saying SMEs do not have time, resources and capacity to implement environment protection schemes (United Nations, 2001a). This makes the small and medium-sized enterprises (SMEs) to be an audience of specific interest.

3.3.3. Service industry

The service industry uses a considerable amount of water and energy in providing their services. This makes it very important for the service industry to track and make efforts to reduce the amount of water and energy used in the industry. Upstream benefits may be obtained because the use of energy and water has environmental impacts. Austrian Federal Ministry of Agriculture and Forestry, Environment and Water Management (AFEW) developed EMA implementation case studies for the food pharmaceuticals, and machinery sector (United Nations, 2001a). The food industry and pharmaceuticals are part of the service industry. The service sector has not received much attention in EMA development like the mining and extractive sector although a lot of work is being done in order to reduce the costs of services, thereby harnessing the benefits of EMA practices (United Nations, 2001a).

3.3.4. Mining sector and extractive industry

The USEPA published reports on EMA in the oil/gas sector and the metal finishing sector (United Nations, 2001a). EMA should be more focused on the sector because of high environment related impacts. These impacts could be turned into benefits if proper environmental investments are made. This is the major area of concentration in this research.

It is important to note that EMA can benefit both small and large firms in many sectors, including resource extraction, manufacturing and service sectors (Ambe, 2007). The manufacturing sector has a potential to unlock many environmental management accounting variables due to its complex nature. Literature shows that the sector has not received much attention because of the difficulties faced in trying to implement EMA. The complex separated parts of the companies in the mining industry are capable of widening the understanding of environmental management accounting. Many benefits can be obtained if EMA implementation in the sector is pursued. Bebbington & Gray (2001) in a case study of sustainable cost calculation (SCC), indicated that the SCC model failed to generate meaningful results but the lessons learn during the process were valuable. The lessons of the same magnitude can be learnt if EMA is pursed in the mining sector and extractive industry.

3.4. Government and Accounting Regulation in the Mining Sector

The regulatory aspects of sustainability accounting and reporting in the mining industry requires the attention of a researcher (Lodhia & Hess, 2014). In some academic and professional circles this type of reporting and regulation is termed ‘integrated reporting(IR)’, which integrates economic, social and environmental information in a concise format and enables a breakdown of the ‘silos’ in an organisation (Lodhia & Hess, 2014).

Accounting regulation in the mining sector is controlled by the International Accounting Standards (IASs) and International Standards on Auditing (ISAs). Together they make the accounting reporting framework which was adapted by the government of Zimbabwe. The GRI reporting framework works as a regulatory framework in Environmental Management Accounting. The GRI reporting framework is intended to serve as a generally accepted framework for reporting on an organisation’s economic, environmental and social performance (Global Reporting Initiative, 2011). The framework is designed to be used by organisations of any size, sector, or location. The GRI framework contains general and sector specific content that has been agreed by a wide range of stakeholders to be generally applicable in reporting an organisation’s sustainability performance which is simply environmental performance (Global Reporting Initiative, 2011).

The GRI framework links closely with the sustainability reporting guidelines. In this sustainability reports you usually find information relating to Environmental Management Accounting. The guidelines consist of principles for defining report content and ensuring the quality of reported information. It also includes standard disclosures made up of Performance Indicators and other disclosure items and guidance on specific technical aspects in reporting.

Government accounting regulation is regarded as a necessary evil while at the same time the state is regarded as a potential threat or resource to industry in society (Tinker, 1984). The accountant therefore needs to understand the process by which regulatory public policy is produced. The neoclassical theory of economic regulation states that regulation is taken for its benefits. It is also concerned about who receives the benefits or burdens of regulation. This is besides the fact that some regulations on industry are onerous. The major function of state regulation is consumer protection, but greater regulation maximises own wealth (Tinker, 1984). In this regard, the wealth of the government and major players in the industry are not affected by regulation. State interventions in regulation are discretionary, which is synonymous with the Zimbabwe extractive industry in which accounting is mostly self-regulated.

There has been significant accounting regulatory reforms in the world (Al-Akra *et al.*, 2009). The accounting regulation are patterns unique to a specific accounting environment. Zimbabwe uses double entry book keeping. The first regulation, company law, requires a company to prepare annual reports with financial statements. There is no set of information specified for disclosure in the financial statements. The Government of Zimbabwe adopted and enforced IAS/IFRS to enhance the disclosure quality of Zimbabwe's listed companies. Taxation has an impact on accounting practices and is a requirement for listed companies to comply with taxation regulation which is stipulated in the Income Tax Act (ITA). In many countries, the government influences accounting regulation for tax purposes. This has resulted in several incidents of accounting manipulation and departure from established accounting and auditing procedures. There is also demand for public disclosure especially for those companies listed on the stock exchange. Enforcement of financial disclosure rules could be achieved using a combination of preventive and punitive measures. Usually the punitive measures are largely the responsibility of government agencies (Al-Akra *et al.*, 2009).

There has been remarkably little regulation of the accounting practice in the extractive industry than might have been expected. Accounting for the extractive industries has been a contested issue for decades (Cortese *et al.*, 2009). This has been caused by lack of uniformity and latitude of acceptable accounting practices in the extractive industries (Luther, 1996). The systems of standardisation have not been extended to mining costs and mining accounts. This is evident in the IFRS standard which

took six years to produce (Cortese *et al.*, 2009; Luther, 1996). Luther (1996) stated that accounting for mining presents severe problems in that the accounts are regarded rather lightly inside and outside the industry. Cortese *et al.*, (2009) support this argument by stating that there are difficulties and uncertainty associated with accounting in the extractive industries. Among them is the lack of comparability in the reporting system. The accounting systems rather conceal information than reveal the financial position. There is a general *a priori* expectation that extractive industries are regulated on a specific industry basis. This is supported by the exclusion of extractive industries from four international accounting standards which are Depreciation (IAS4), Research and Development (IAS9), Property, Plant and Equipment (IAS16) and Leases (IAS17). The expectation is due to the complexities in the extractive industries. The complexities range from the fact that the extractive industry is a company of finite life: once all commercially feasible ores have been exhausted the company might end. The companies have wasting assets and the value of the company is derived from sales of mineral reserves. The true value of capital is not maintained, that is, the depletion of ores is not charged against revenue. There is also a lack of a direct relationship between costs and revenue in extractive industries. The costs are not influenced by revenue received. The extractive industry faces more public accountability pressures than many other industries and it is on the forefront of environmental reporting.

The developments in accounting regulation have been responses to financial reporting shocks and societal needs (Luther, 1996). The duty of legislation was to exert some degree of control. Regulation in the extractive industries ensures protection of investors in the industry. It also enforces honest and trustworthy dealings. The oil and gas accounting received more attention than that of other mines in terms of accounting regulation development. Australia is the first country to have standardised mining accounting standards or regulations. Many countries do not have specific accounting standards to cover the mining sector like Zimbabwe. The Financial Accounting Standards Board (FASB) failed in regulating general mining accounts. The evidence of this is the inability of the board to produce specific accounting regulations over the years especially in environment related accounting practices. Lack of regulation in the mining sector can be a reason for monopoly by big companies. Prescriptive accounting regulation seem not to work in the mining sector, since the sector is forward looking

In Zimbabwe, the accounting profession is regulated by the accounting profession's Institute of Chartered Accountants Zimbabwe (ICAZ) together with the Public Accountants and Auditors Board of Zimbabwe (PAAB(Z)). The ICAZ adopted the full version of IAS without amendments which is a common practice in Africa (Al-Akra *et al.*, 2009; Owusu-Ansah, 1998). The Zimbabwe Stock Exchange regulates the production of financial statements for listed companies in accordance with the IASs (Al-Akra *et al.*, 2009). The PAAB and ICAZ play an advisory role. They do not have

authority to issue accounting standards. They work together with the South African Institute of Chartered Accountants (SAICA). The regulation process is promulgated by the government. There is also no enforcement mechanism in existence, particularly punitive measures to ensure compliance with the disclosure requirements of the law, except if the companies are listed on the stock exchange. There are no legally established accounting and auditing standards in Zimbabwe. The legal system is important for accounting regulation. The accounting mining practices are influenced by taxation. There is complete lack of standardisation in mine accounts just like in South Africa (Luther, 1996). There is no government backing and the accounting standards rely on professional bodies for their authority. Many governments in the past had to introduce accounting regulation after major shocks or crisis (Luther, 1996). There is need to balance political will in favour of regulating extractive industries accounting. It has been observed that regulation tends to increase during times of mining boom and the rise in commodity prices. This is typical of the Zimbabwean scenario.

The accounting profession is also regulated by the Accountants Act (Chapter 215) through the ICAZ. The ICAZ should establish, adopt and publish accounting standards (Owusu-Ansah, 1998). ICAZ is a member of SAICA, IFAC and IASC. The accounting policies in Zimbabwe vary by industry. Certain industries are highly regulated because of their contribution towards export earnings or national income. The companies may be subject to rigorous control. Regulation may affect disclosure and reporting practices of an industry. Reporting is affected by the nature of the work involved, for example, the oil industry has difficulties in depreciation accounting (Owusu-Ansah, 1998). Accounting regulation goes beyond accounting standard setting to societal regulatory processes driven by accounting logic (Laughlin, 2007). Regulation means organisations are not isolated islands located in society that have regulatory intents. It gives a link between society and organisation relationship with a focus on accounting. Accounting regulation is a way of thinking and should serve information needs of stakeholders through stewardship reporting. Regulation supports decision usefulness interests. Government dominates the nature of accounting regulation. There is need to make a clear distinction between regulation of the profession or by the profession. The government keeps watching and has power and authority over accounting standards setters. Government also allows the profession to either regulate itself or to restrict self-regulation (Laughlin, 2007). Government has a unique role in the regulation of the accounting standard setters. The government may choose not to regulate and keep a watching brief: this shows that the government is satisfied that things are going well (Laughlin, 2007).

The need for a standardised approach in the extractive industries was recognised as early as 1905 (Cortese *et al.*, 2009). It was noted that accounting and disclosure practices in the mining sector were inadequate. There are powerful extractive industry players who want to keep the *status quo* in

accounting methods and regulation for their benefit (Cortese *et al.*, 2009). This is typical of Zimbabwe as well, where, you find powerful companies influencing the regulation of the mining sector. The extractive industry has been defined as the petroleum (oil and gas) and mining industries that are involved in finding and removing natural resources located in or near the earth's crust (IASC 2000:14 as cited in Luther, 1996). The full cost method and successful effort method are used to determine the costs of pre-production activities in the extractive industries. The full cost method results in increased reported income over the successful effort method. High profits are recorded under the full cost method and companies are at will to use any method. One method is not favourable to all companies. It was, however, argued that the two methods do not provide relevant information for decision making.

Accounting for extractive industries is an international accounting issue. There are divergent accounting practices in the extractive industries. There continues to be a definitive lack of accounting guide for the mining sector companies even with IFRS 6 which took six years to issue (Cortese *et al*., 2009). The standard raised basic issues which contradict with the profession which argues that the standards are enough to address environmental issues in the mining sector (IFAC, 2005). The IFRS 6 failed to eliminate choice in accounting methods which do not, in total, fairly represent the company financial position

3.5. Summary and Deductions

Literature indicates that indeed the extractive industry and mining sector have been a contentious issue for decades. Government is responsible for the development of accounting regulation together with the accounting profession. There is no specific regulation of EMA being pursued by governments except for evidence from ministries in other countries. The development of regulation in the mining sector is mainly motivated by the need to protect the investors as well as the maximisation of wealth of powerful mining giants in the sector. It is also important to note that there is a political will at play in the development of mining accounting regulations. Most countries like Australia who developed accounting regulation were able to do that in a time of crisis or economic boom or shocks in financial reporting. Evidence from this current review shows that EMA accounting regulation has not been fully developed in Zimbabwe and all over the world. The next section discuss research methods used to achieve objectives set out in Chapter 1

CHAPTER 4
RESEARCH METHODOLOGY

4.0. Introduction

Chapter 1 of this study discussed Environmental Management Accounting and the gaps that the research is seeking to address. This was followed by a review of literature relating to Environmental Management Accounting exposing the gaps in Zimbabwe. Chapter 3 discussed the regulatory framework in Zimbabwe. The chapter indicated that EMA is not regulated in Zimbabwe as much as other countries are regulating. There is paucity of literature which indicates the extent to which Environmental Management Accounting is being implemented in Zimbabwe's extractive industries.

The IFAC framework stands as the overall accounting guideline used in Environmental Management Accounting all over the world in different economic sectors. The aim of this chapter is to firstly, provide a discussion on the research design for this study, secondly to provide the research methodologies that were used to substantiate the relevance of Environmental Management Accounting in Zimbabwe's extractive industries and mining sector and lastly, to verify and validate whether Environmental Management Accounting enhances sustainability of the sector. This is all done in an effort to answer the research questions which were developed in Chapter 1 of this study.

4.1. Overview of the design

Environmental Management Accounting is a transdisciplinary field of study and follows a transdisciplinary approach to research (Burritt & Christ, 2017; Schaltegger *et al.*, 2017). This is evident in the issues involving environment, accounting and sustainability. The field of study requires professionals from different backgrounds to work together for proper development and implementation of EMA frameworks. The transdisciplinary approaches helps in solving complex and interconnected problems of the world. The design follows a transdisciplinary approach in addressing the research questions raised in Chapter 1 section 1.5.

4.2 Research Paradigm

It was important to study the nature of EMA in order to understand the reality behind the development and implementation of EMA systems in Zimbabwe. This was done under social construction or constructionism (reality is socially constructed) and follows the interpretivist philosophy which is necessary to explore the subjective meanings motivating the actions of the social actors for the researcher to understand these actions. This research sought the subjective reality of what is happening in the mining sector of Zimbabwe in as far as the implementation of EMA is concerned in order to make sense of and understand their motives, actions and intentions in a way that is

meaningful. Environmental Management Accounting from the perspective of the developers of the phenomenon has a reality that is different from the reality of the implementing companies that perceive that reality.

The ontological position of this research is that of the objectivist. This research adopts the objectivist-subjectivist approach. This was because the dissertation did not only seek to describe the implementation of EMA in Zimbabwe's extractive industries. It sought also to identify and link causal variables of the reasons why companies may not be willing to pursue EMA. The research also sought to understand the perceptions of people and organisations in EMA implementation. That includes cultural beliefs, the regulatory environment, disclosure and reporting of environmental impacts in the extractive industries. In addition, the research sought to understand how EMA is being implemented and to do that without being involved was impossible. The researcher did not place reliance on data collected based on feelings as these are considered as social phenomena without external reality.

What constitute knowledge in the field of environmental accounting or sustainability accounting, is what is known through scholars and the pioneers of the area of study. Any knowledge outside the parameters and frameworks developed which have been socially constructed to be true have a possibility of being thrown out of the field of study by EMA proponents. This is not to say any new knowledge which can be obtained in this study does not constitute Environmental Management Accounting or sustainability accounting. Extant literature opposes the notion that what constitutes knowledge in EMA is what we know and gives new ways and dimensions of thinking about EMA which is outside the conventional accounting thinking of debits and credits as expounded by Deegan (2013).

The study adopted the interpretivism paradigm following a qualitative approach in data gathering because of its subjective nature. The major challenge of the interpretivism paradigm is to understand the social actors' world from their point of view. The interpretivist research relies on the social actors' views of the situation being studied and recognise the impact on the research of their own background and experience, which in turn helps to reduce or minimise bias. The study heavily relied on the interpretations of EMA from the views of the participants in the extractive industries and mining sector.

The study adopted a qualitative research paradigm together with an interpretivist philosophy to understand what is currently happening in the mining sector in as far as the implementation of EMA is concerned. The interpretivist paradigm helped the researcher in understand social phenomena under study by observing and gathering data from the perspectives of the individuals involved in doing the actual work. This included gathering qualitative data through interviews, questionnaires and company

financial/sustainability reports. The qualitative data in the form of financial reports and sustainability reports provided information independent from the social actors. In doing this the researcher ensured that the research is relevant to the research questions set out for this study.

The researcher gathered information from company sustainability reports and from the preparers of the reports. For the researcher to do this without being involved in the research is difficult. The study evoked some emotions since the researcher looked at whether EMA encourages or enhances sustainability and also the inter relationship of EMA reports and what is actually transpiring in the mining sector. The researcher went ahead to check whether reporting by companies is not a reflection of camouflaging to portray a good image (impression management) to the external stakeholders and yet on the ground nothing is happening (green washing). 'Green washing' has been defined as selective disclosure of positive information about a company's environmental or social performance, without full disclosure of negative information on these dimensions, so as to create an overly positive corporate image (Michelon *et al.*, 2016).

The location of this study was the mining companies geographically spread all over Zimbabwe with most of them having head offices in Harare. Data reliability was strengthened through triangulation where several data collection methods are used to compare results. The other method which was used to ensure reliability of the information was to use consistency checks with literature in order to compare the findings of other authors in the same field of study like Mohr-Swart (2008) who did an Environmental Management Accounting model for the South African mining industry.

The inductive approach dominates the study, however the interpretivism paradigm which calls for subjectivity and inductive reasoning towards meaningful conclusions was the main philosophy in EMA (Lamberton, 2005).

4.3 Research Approaches

Research approach involves the use of theory. The theory is usually not explicit in the research design stage but came out clearly in the data presentation and analysis stage. Induction helped the researcher to get a feel of what was going on, so as to understand better the nature of the problem under study. In this study the researcher obtained information from the extractive industries and mining personnel to understand the implementation and development of EMA from the perspective of the implementers. From there, the researcher developed a framework for EMA implementation informed by data collected and literature reviewed.

Inductive research does not provide a rigid methodology; it allows alternative explanations of what was going on in the mining sector which makes it a more suitable approach, at the same time not

discrediting the reliability which is brought by the deductive approach. Inductive approach was used in this study because it is more concerned with the context within which events take place.

This study explored the reasons behind EMA practices and described EMA status in the mining industry. The researcher used the abductive logic reasoning research approach to understand EMA. Abduction has been simply defined as the creative, imaginative or insightful moment in which understanding is grasped or is thought to be grasped (Lipscomb, 2012). This form of reasoning often generates 'correct' conclusions (Lipscomb, 2012). "It is a form of extremely fallible insights"(Peirce, 1998 [1903]). Pierce (1955) as cited in Echenim, Peltier & Tourret, 2013) explained abductive reasoning as a "process of inferring relevant hypothesis from data (as opposed to deductions which consists in deriving logical consequences of axioms)". Knowledge of different research traditions enables the researcher to adapt research design to cater for constraints. These constraints may be due to practical involvement in the subject matter, limited access to data as in the mining and extractive industries, or they may result from a lack of prior knowledge of the subject.

4.3.1. Qualitative/quantitative approach

The researcher had to make a choice whether to adopt the qualitative or quantitative approach or a combination of the two. There are three factors that influence the choice of a research paradigm to work in: the epistemological stance of the researcher; the nature and type of research question or problem to be addressed and the researcher's previous skills, training and the resources available (time, money and personnel) to the researcher.

There is a wealthy of literature on the qualitative and quantitative approaches to research (for example, Bowen, 2005; Bryer, 2014; Creswell, 2012; Frankel, Jennings & Lee, 2016; Lipscomb, 2012; and Tashakkori & Teddlie, 1998). Quantitative research usually adopts a deductive approach with an emphasis on testing theories while the qualitative approach takes an inductive approach with an emphasis on developing a theory from the perspectives of the actors involved with the phenomenon under study. A lot of debate is happening on whether the two approaches can be combined (See for example, Creswell, 2002; Johnson & Onwuegbuzie, 2004; Tashakkori & Teddlie, 1998). Sale, Lohfeld & Brazil (2002) reject the notion that the two approaches can be combined because the world views of qualitative and quantitative researchers are completely incompatible and mutually exclusive on the basis of their different epistemological and ontological traditions. Johnson & Onwuegbuzie (2004) further argue that if the research questions are oriented towards either the qualitative or quantitative paradigm the two methods should not be combined. The two methods, it is further argued, can be combined for complementary purposes not for cross examination or triangulation purposes (Sale *et al.*, 2002).

The study adopted the qualitative research paradigm. The researcher explored a research problem, in this case, the relevance of EMA in the mining sector and its possible contribution to enhancing sustainability in the extractive industries and mining sector. Qualitative research paradigm was used to gain detailed and unique insights from EMA practitioner's perspective. Alewine (2010) and Jonker & Pennick (2010) support the use of qualitative method to gain detailed insights of a phenomenon under study. Alewine (2010) went on to state that local and particular knowledge sharing can greatly benefit entities wishing for a starting point on how to address environmental issues. This notion has been proved to be true since literature reveals that Environmental Management Accounting is in its entry level especially in developing countries under which Zimbabwe falls under (see for example, Lodhia & Hess, 2014). The mining companies in Zimbabwe are believed to be in entry level in as far as the implementation of EMA is concerned (Muza & Magadi, 2014). As part of qualitative research, interviews with case studies were used to assess the state of Environmental Management Accounting among European countries (Bartolomeo *et al*, 2000).

A more detailed analysis of particular businesses or governmental operations or processes can be achieved by the use of the qualitative approach to research (Alewine, 2010). Alewine (2010), further explains that qualitative methods allow for more diverse and in-depth inquiries, something that garners particular importance with relatively new interest in environmental cost accounting issues and related environmental management decision making. The qualitative method is beneficial to social and environmental accounting (SEA) research because it provides real-world examples of how entities adapt to environmental accounting issues (Alewine, 2010). This is further supported by (Bowen, 2005) who indicated that quantitative and qualitative research have complementary strengths, the main advantage of qualitative research being that it yields data that provides depth and detail to create understanding of phenomena and lived experiences.

(Mohr, 1999) argues that the qualitative designs or approach is better than the quantitative approach precisely because its goals or functions have greater value than the goals of impact analysis. This reasoning and argument resonates well with this study which looks at relevance of EMA in the extractive industry and mining sector of Zimbabwe. Mohr (1999) further explains that a design whose purpose is to determine impact is considered qualitative if it relies on something other than evidence for the counterfactual to make a causal inference. The advantage that is offered by the qualitative design is what the researcher sought to achieve, the assessment of current and potential relevance of EMA for sustainability in Zimbabwe's extractive industries in as far as the implementation of EMA is concerned rather than just a computation of quantitative data without an understanding. Christ & Burritt (2012) argue that many organisations are failing to engage with EMA activities, thus it will be valuable to employ the qualitative research method to develop a deeper understanding as to why

such a lack of engagement is the case in EMA. The authors state that there is a "disturbing" lack of systematic evidence of EMA implementation on behalf of organisations (Christ & Burritt, 2012). This lack of evidence has been addressed in this study by the adoption and use of qualitative methods to gain an understanding of EMA.

Quantitative research has not been chosen because of some of its weaknesses observed by Johnson & Onwuegbuzie (2004) that the knowledge produced may be too abstract and general for direct application to specific local situations, context or individuals. They also indicated that a quantitative research may miss out phenomena occurring because it focuses on theory and hypothesis generation, which is the confirmation of bias. Other authors argue that quantitative studies restrict our views as human beings because they concentrate on repetitive and predictable aspects of human behaviour. The approach overlooks some important aspects of human behaviour such as human actions, attitudes, perceptions, beliefs, interests, and the historic or current context of the research. People's views are submerged under facts and figures. In this specific research, quantitative research could not address some of the phenomena the researcher is interested in such as the experiences of the individuals responsible for Environmental Management Accounting, like accountants, engineers, environmental managers and the owners of the companies themselves. Qualitative research was able to overcome these shortcomings. This is not to render quantitative research useless, but for this research was not appropriate to heavily rely on quantitative research. Data collection and analysis in quantitative research is not time consuming and rigorous as qualitative research. There are weaknesses in qualitative research which are noted as lack of well-defined and laid down procedures, which limits the researcher's capacity to draw definitive conclusions. The qualitative approach uses a small and unrepresentative sample which makes the generalisation of findings difficult (Johnson & Onwuegbuzie, 2004).

4.3.2. Justification for research approach

Jick (1979) posits that no single methodology can produce scientific progress. The use of more than one method enhances the credibility and reliability of the research results. However, the researcher had to choose qualitative method which has been proved to work in Environmental Management Accounting and which has produced results in past research (Alcouffe *at al*., 2010; Bartolomeo *et al.*, 2010; IFAC, 2005). As mentioned above, this does not render other methods useless or inappropriate for this study. The researcher is of the opinion that triangulation or mixed methods, and the use of qualitative and quantitative methods was going to yield more credible and robust results but in the interest of time, and in all fairness to the two methods, time allocated for this research to be completed in three years was not going to be enough to do a thorough investigation using both methods.

It is the researcher's contention that qualitative research takes the centre stage in social and environmental accounting (alternative name for EMA) as shown by some researchers (Bartolomeo *et al.*, 2000; Bowen, 2005; Lamberton, 2005; Alewine, 2010; Christ & Burritt, 2012; Albelda, 2011; Qian *et al*., 2015; Ambe, 2007) with some researchers using quantitative research (see for example, Phillis & Andriantiatsaholiniaina, 2001). To go outside the normally accepted position of the scholars in the field will result in a research that is not entirely understood by the scholars in the field of study.

The researcher adopted an approach that could answer the research questions laid out in chapter 1, the pragmatic approach because it is both theoretical and methodologically rigorous and relevant (Saunders, Lewis & Thornhill, 2009) to this particular study. The pragmatic approach is practical in view of how research should be done. It tries to consider the positive aspects of any method chosen. This means that the researcher had to be practical in going about qualitative research and consider issues which give more credibility and validity to the research like the issues to do with an in-depth understanding of EMA. The most important thing is the 'understanding' part of the contribution (Creswell, 2009) which was achieved by a qualitative design which this research adopted. The researcher explored the practical experiences in this study to gain an understanding of the truth or current meaning of what is actually transpiring in the mining and extractive industries of Zimbabwe. Multiple forms of data collection were used to answer the research question in this pragmatism approach.

4.4 Research Design

The purpose of this section is to spell out the type of study undertaken to provide acceptable answers to the research problems identified in chapter one. Research design alternatives are given together with alternatives used in this study, data collection and sampling methods follow and lastly data analysis procedures are given. The purpose of the study is a description of EMA and the association between EMA variables. The exploratory design adopted minimises bias and maximises reliability of data collected and analysed (Kothari, 2004; Robson 2002:59 as cited in Saunders, Lewis & Thornhill, 2009).

The researcher clarified the problem in the mining sector in as far as the implementation of EMA is concerned, and the role of EMA in improving extractive industries and mining sector sustainability. Entry into interviews in the mining sector was done through snowballing since the sector is difficult to penetrate. Change of direction was possible in this kind of research because of new data and the researcher should be willing to adapt to these new changes because of new data and new insights (Saunders, Lewis & Thornhill, 2009). Conclusions at the end of the descriptive was drawn from the collected data. Explanatory studies are used together with quantitative or qualitative data. Qualitative

data in this study was used to explain the reasons why the mining sector was interested or not interested in pursuing EMA; this was done in an effort to investigate if the reasons given were in line with the theories which lead to the adoption of EMA which have been put forward in chapter three of this study.

Given the nature of the research problem and the research question which includes qualitative research questions, the researcher decided to select the survey, archival and case study research design as appropriate for the study. Survey, archival and case study data were used to answer the research questions outlined in chapter one.

In this study the survey data collected by companies through their environmental reports or sustainability reports were used. Obtaining data was quick and cost effective. Most of the information was publicly available. The sustainability reports contained considerable breath of information, insights and were appropriate for the study's unit of analysis which is the mining sector. The only disadvantage with this data is that the survey data cannot be controlled directly as the researcher did not participate in either the research design or data collection process.

Data was also obtained by using questionnaires. The questionnaires were used to augment secondary data. The response rate of questionnaires was more than the expectations of the researcher. In the initial stages the researcher did not rely heavily on this data collection method which later gave more information. Out of the 100 questionnaires which were distributed to 34 mining companies, the research got an overwhelming response rate of 72. The study is a case study with a particular unit under consideration being EMA in the mining sector. Companies in the mining sector were investigated to check if they are implementing EMA. This helped the researcher to understand the potential relevance of EMA in relation to sustainability in the extractive industries. How companies define EMA was explored to gain an understanding of the reality of EMA in practice and in relation to international best practices.

According to (Schaltegger, Viere & Zvezdov, 2012) case studies have become common in management accounting research in general and in EMA research in particular. This notion is further supported by (Parker, 2012) who argues that for management accounting, the most frequently means of engaging with organisational processes and accounting practices has been the field based case study research genre. The researcher was in direct contact with organisation settings, conducting in-depth research into actors and their contexts in their natural occurring settings. This case based research investigated the current and potential relevance of Environmental Management Accounting in Zimbabwe's extractive industries. Based on the EMA framework *(*Burritt *et al.*, 2002; IFAC, 2005)

the study explored whether EMA improves sustainability in the mining sector, and the study analysed the process of establishing environmental information management with EMA tools.

The case study research design was chosen to better understand the complex EMA systems which differ from one company to another. EMA processes have different names depending on what companies choose to name the recording and management of environmental impacts in monetary terms. Specific types of environmental data which were used for environment-related decisions by managers were analysed. As suggested by Ferreira *et al.,* (2010) and Parker (2012) the aim was to offer rich accounts and understanding of organisational practices.

The approach used in this case study is similar to the one adopted by (Schaltegger, Viere & Zvezdov, 2012) in which they stated that " Based on the EMA framework the specific decision-making context of the company were analysed to identify the most suitable EMA tool(s). This was done by asking company managers about their decision situations and information needs. The managers were not aware of the EMA framework until the case study was finalised. Rather than elaborating on the usefulness of specific EMA methods for various businesses, the research approaches EMA by focussing on the needs and the specific decision situations company managers' face. This approach helps explore current practices, increases the benefits of EMA for management and meet the reality of management accounting, where internal decisions about varied and rather different issues have to be prepared, assessed and made independent of predefined systems or standardised tools". The most important aspect in this approach is that the EMA framework was not disclosed to the managers; this helped in exploring current practices in as far as the implementation of EMA is concerned, at the same time increasing the benefits of EMA for management.

The case study was conducted with the help of 'local resource persons'. These are mainly environmental managers, engineering consultants, accountants, accounting clerks as well as other knowledgeable people who take part in EMA development and implementation.

The data collection techniques in case study design are various and may be used in combination. This study used interviews, document analysis and questionnaires. The researcher heavily depended on survey data through questionnaires supported by interviews and document analysis. This was done due to the difficulties involved and documented in accessing the mining sector in the past. In this case study design the researcher used and triangulated multiple sources of data in order to get the information that is reliable and valid. Saunders *et al.,* (2009) explains triangulation as referring to the use of different data collection techniques within one study to ensure that the data are "telling you what you think they are telling you". The case study strategy incorporates multiple cases, that is, more than one case as opposed to a single case study strategy. The rationale for using the multiple case

strategy is the need to establish whether the findings of the first case occur in other cases and, consequently, the need generalise findings. The study follows the holistic case study dimension as opposed to the embedded case study in which the researcher is looking at the entire extractive industry and mining sector to understand the implementation of EMA in the entire sector.

The researcher used archival data in the form of sustainability reports. The research wanted to make use of the list of ledger accounts produced by companies. The idea was informed by IFAC (2005) who states that the starting point of data collection in EMA is the list of accounts which indicates the activities an organisation is involved in. This was not possible because of privacy issues given and surrounding the data in the mining industry. The companies under study were not willing to share their list of ledger accounts and the research had to explore other avenues. The ledger accounts were listed under the confidential information of the mining companies, although the researcher indicated that he was not interested in the transactions and account details of the ledger listings but just the account listings to determine the pattern of items recorded under environmental or sustainability accounting.

Archival strategy allows questions which require data from the past to be answered, be they explanatory, descriptive or exploratory questions. The ability to answer such questions was limited by the nature of the archival records or documents being used. This required the researcher to supplement the archival data with other data collection methods because it is rare to find precise information in already existing documents like sustainability or environmental reports which answer all the research questions being posed. Some information was missing and access refused to certain types of information like the ledger account listings of companies in the mining sector. This means the researcher had to establish the data available and design the research to make the most out of the available archival data.

Obtaining primary data was difficult in the mining sector, hence, the researcher identified entry points through which he managed to get data from the industry. That was through friends and business networks in a process called ‘snow balling’. These networks referred the researcher to other people in the industry until the researcher obtained sufficient information or reached saturation in the phenomenon being investigated. Interviews were requested through these entry points, and questionnaires were also distributed through these networks which were trusted in the extractive industry and mining sector. The research was conducted in an area in which the government has much interest as well as the international community. A lot of changes are happening in the sector and the researcher was being construed as someone collecting information for external people and hence the information was not released in time, so obtaining trust in the sector is a very important milestone

which can be obtained through trusted informants in the sector who can act as go-betweens. This led to delays in the data collection process which took about eight months. The major delays were in ethical clearance processes with the Ministry of Mines and Mining Development which will be discussed under ethical considerations.

The field work data in different mining companies complemented the archival data and acted also as a supplement to the already existing data. The field work data was collected in Harare central province of Zimbabwe in which most of the companies have head offices. The mining companies' operations are spread all over Zimbabwe's ten provinces. This centralised locality of mining companies being in the capital city of Harare helped the researcher to reduce travelling expenses and to make follow up easy.

4.4.1. Sampling design

A sample is a segment or a subset of the population that is being investigated (Bryman, 2001 as cited in Njaya, 2013). Sampling is a process of selecting participants. The process of selecting a sample is known as sample design (Kothari, 2004). Kothari (2004) further explains a sample design as a definite plan determined before any data are collected for obtaining a sample from a given population. There are many different sampling techniques or ways in which the sample group can be selected (Cassim, 2011). In this study, mining companies constitute the population units. The sampling techniques include probability and non-probability methods. This research made use of the non-probability sampling method. The researcher did not know the chance or probability of any particular member of the population being selected in the sample. There was a high chance of including some members of the population in the research than others. The main types of non-probability sampling are quota, judgemental and snowball sampling (Tharenou *et al.*, 2007).

The researcher used the snowball sampling research design. He began by sampling a small number of mining companies who satisfy the inclusion in the study (these were the companies in which the researcher had networks or informants). The researcher went on to ask these initial companies to identify other companies (or individuals in other mining companies) who met the criteria. These subsequent respondents in turn identified others and so on (Creswell, 2012; Saunders *et al.,* 2009. The intent was that the initial small sample would 'snowball' into a larger one. This method was used because it was appropriate for this study which had a rare and inaccessible population. The 'snowball' determined when to stop gathering information or data. Thirty-four (34) companies were reached through this approach for collecting primary data through questionnaires.

4.4.2. Data collection procedure

The researcher sought to understand the methods which are appropriate for data collection in this section. The primary research aim, to explore how the environmental impact of extractive industries and the mining sector will be more accurately recorded by means of EMA applications, meant that one had to be able to answer the question: what is the environmental impact of extractive industries and the mining sector that can be more accurately recorded using EMA applications or systems? Once the environmental impacts are known and the means by which they can be recorded in accounting terms, methods need to be chosen which consider site-wide or organisation-wide annual costs and benefits related to environmental issues.

As mentioned in the sections above, the researcher attempted to use raw data from the ledger accounts (IFAC, 2005), which is the most common source of cost information within an organisation. Working with the list of accounts allows an assessment of site-wide or organisation-wide annual costs related to environmental issues. The chart of accounts was going to enable the researcher to understand the environmental categories within an organisation. The researcher was interested in understanding the inconsistencies in accounting systems by looking at the chart of accounts. The researcher could not access this information and managed to access company financial records in the form of published financial statements and environmental or sustainability reports to assess the availability of environment related information (costs and revenues) and the nature of the reports which are produced in the mining companies. The financial statements and environmental reports (sustainability reports) revealed the different modalities in the reporting systems.

The researcher used case data (self-collected data) which was collected from 34 different mining companies. Data collection took eight months, from January 2016 to August 2016. Data collection involved planning, implementation, the actual process of gathering data in the field and analysis. Given that the researcher was involved in the field this gave him an insight into the implementation modalities of EMA in the mining sector. The impact of Environmental Management Accounting in the sector generated stories which acted as a supplement to the data from document analysis.

Case studies were looked at in other countries (through literature) in the mining sector, and these were used to analyse data (as literature references in discussion) and develop the model framework for Zimbabwe. Case studies give detail of cost calculations which differ from case to case. The approach of this research aimed at describing and interpreting the process which ended in the construction of a model framework for the implementation of the Environmental Management Accounting system.

Various case studies allowed the researcher to obtain very rich data and interpretations regarding the implementation of EMA.

The multi-method approach to data collection was used. The methods included questionnaires, interviews and document analysis. The multi-method approach helps in improving quality and validity of case data through data triangulation. Data collection techniques used to gather case data are explored in the following paragraphs.

The researcher, after accessing companies' financial records, had to make appointments for interviews to clarify financial reports shortcomings and get clarification of information from survey data. In these interviews, the researcher was guided by the 'snowball' sampling research design. The researcher requested the mining companies to refer him to other knowledgeable companies until the required information was obtained.

The qualitative research method involves conducting individual semi-structured interviews in areas where sufficient information cannot be obtained from secondary data. One-on-one interviews were conducted guided by the snowball effect of the research design. The interviews were conducted in mining companies which indicated information gaps in areas the researcher was interested. Interviews helped the researcher to gain in-depth information which was a major advantage in conducting interviews. The interviews were semi–structured in nature and informal. This offered flexibility in being able to follow up on the individual interviewees' responses at the same time as maintaining consistency in the questions being asked (Cassim, 2011).

Unstructured interviews were conducted by the researcher. These are in-depth interviews which involve open-ended questions and use extensive probing to get respondents to express detailed information on the research subject. The participants ended up exploring different areas and paths in an unstructured interview as long as they were in line with what the researcher was willing to cover (Saunders, Lewis & Thornhill, 2009).

Questionnaires were used to interact with communities as well as employees in the mining companies. The purpose of the questionnaire was to capture opinions, perceptions, and views of the people involved in Environmental Management Accounting of different companies. The questionnaire was designed to allow for structured assessment, identification and discussion of main themes which are relevant to the research question. This made the classification, organisation and interpretation easy for the researcher.

The research instrument was tested and reviewed by different stakeholders in the mining sector, among them the Ministry of Mines and Mining Development, the Ministry of Environment, Water and Climate Change, mining sector personnel which include colleagues in the accounting profession.

This was done to ensure that the instrument is easy to use and is understandable by research participants. A pilot study was done with five individuals from different mining companies drawn from the population. The aim of the pilot study was to test the research instrument, and to find out if there are any difficulties in completing it. The instrument was tested for acceptability, clarity, wording and length so that the data would be meaningful. Five questionnaires in total were sent, three by e-mail and two delivered in person. The questionnaires were followed up telephonically. In seven days all the questionnaires were returned with comments.

Feedback from pilot study showed that the questionnaire was too long but relevant to capture all the required information. The researcher adjusted the questionnaire for typographic errors as well as sections which were not clearly worded in order to capture the intended meaning. The questionnaire was structures in a way that it allowed the respondents to give their views/ opinions on EMA without any limitation. The questionnaire was latter administered to those research participants in the population which were willing to participate and identified through the snowball sampling technique.

Observations were not conducted due to the complexities and challenges in the political environment of companies in the mining sector. During data collection and before, the researcher made frantic efforts to find a company to do the observations but received regrets throughout the companies. The companies were not willing to communicate their position in writing to the respondents, the regret message was communicated indirectly through telephone. Observations were going to give first-hand information of the processes in the mining sector, how data is recorded by means of EMA, and the ability to check the physical flow of information.

Secondary data was used to formulate the research objectives and answer the research questions. Various secondary data was obtained in the form of annual reports, financial reports, sustainability reports (list of ledger accounts could not be obtained) from the mining companies as well as from the government of Zimbabwe statistics department. Miles & Huberman (1994), Silverman (2001) as cited in (Njaya, 2013) pointed out the major strength of document analysis as its stability and unobtrusive nature since the data were there before the study was carried out. The major challenge is its irretrievability and inaccessibility especially information from the mining sector and the classified government information. This particular research depended heavily on both primary and secondary data due to the difficulties involved in obtaining information from the sector through interviews, questionnaires and/or observation. The data obtained enabled data triangulation. The next section will look at data analysis procedure.

4.4.3. Data analysis procedures

Data analysis was done to ensure that collected raw data makes sense and answers the research question. The process of data analysis involves making sense of the texts and images. It involves preparing data for analysis, moving deeper into understanding the data, representing it and making an interpretation of the larger meaning of the data (Creswell, 2002). In a qualitative case study methodology, themes (or perspectives or dimensions) emerged through the data analysis (Creswell, 2002). In order to do this, the researcher was guided by different methods of combining qualitative and quantitative data which were given by (Creswell, 2002) as merging, connecting and embedding data. Merging data involves combining qualitative data in the form of texts (or images) with quantitative data in the form of numeric information. Connecting involves analysing one dataset (secondary data) and then using the information to inform the subsequent data collection in a qualitative research. The researcher analysed the financial reports, sustainability reports and integrated reports. The information obtained in these data sets was used to inform data collection through interviews and questionnaires. Given that this research followed a qualitative paradigm, the connecting data procedure was used.

The effect of non-responses on the survey (response bias) was mitigated by the use of different data collection methods (data triangulation). The researcher considered contacting the respondents through telephone or e-mail to determine if their responses differed substantially from other respondents. A descriptive analysis of data for all dependent and independent variables was given.

“Atlas ti.” was used to code data from document analysis, interviews and questionnaires into different themes which emerged from the data. Coding is the process of organising the material into ‘chunks’ before bringing meaning to those chunks (Rossman & Rallis 1998 as cited in Creswell 2002). It involves taking text data or pictures and segmenting sentences, or images into categories with a term in the actual language of the participant. The researcher, first got the sense of all the documents, reading transcriptions, jotting down ideas as they come to mind, and asking himself what the documents were all about to get the underlying meaning of the documents. A list of all topics which were emerging from document analysis was made, followed by clustering together similar topics. Major topics and minor topics were put separately. This list was used as codes, with the codes written next to appropriate segments and text. These steps engaged the researcher in analysing textual data in a systematic process using ‘Atlas.ti” qualitative data analysis software. The codes appeared as the major findings in this study.

4.4.4. Validity and reliability in qualitative research

Validity and reliability are used to assess the quality and integrity of research. According to (Creswell, 2002) validity is not a companion of reliability (stability or consistency of responses) or

generalizability. Qualitative researchers can use reliability to check for consistent patterns or theme developments. Facets of multiple case studies can be generalised using reliability measures to other cases. Reliability and generalizability play a minor role in qualitative inquiry but validity is viewed as a strength of qualitative research. Validity was used to determine whether the findings are correct and accurate from the standpoint of the researcher, participant and any other interested party. In a qualitative inquiry, the use of terms such as trustworthiness, authenticity and credibility point to the idea of validity (Creswell, 2002).

The researcher implemented different strategies to check the accuracy of findings. One of the methods mentioned in the previous sections is to triangulate different data sources. This helps to come up with the same themes using different data collection techniques and sources to justify the existence of the themes which were emerging from all sources of data. The researcher also took the final report back to the participant or specific descriptions or themes to find out if the feel of information was accurate. Use of thick descriptions was made to take the reader to the research field setting. The researcher also indicated any biases he might have had while carrying out the research. This self-reflection creates an honest narrative which appeal well to the readers. Negative information which is contrary to the objectives of the research and the themes which emerged in the study were discussed because real life context consist of different items, so the researcher avoided the bias of including only positive information which helps the research to proceed. The researcher feels that adding negative information added to the credibility of the account for the reader.

The researcher spent 8 months in the field collecting information and asking how Environmental Management Accounting is being implemented on a day to day basis by the participants. This helped the researcher to have an in-depth understanding of EMA and obtained credible first-hand information. Peer debriefing was used to enhance the accuracy of what is happening in the extractive industry and mining sector of Zimbabwe. Lastly, the researcher tried to seek an external auditor to review the information as distinct from a peer debriefing. The auditor was new to the researcher and the project and gave an overall assessment of the overall research process.

(Creswell, 2002; Guba & Lincoln, 1994) identified four criteria for assessing the accuracy and trustworthiness of qualitative research as credibility, transferability, dependability and confirmability. These four criteria's were satisfied in this study. Validity of the case data was checked through a prolonged period of engagement in the field, writing notes, and engaging with the literature to check if the results being obtained relate to other Environmental Management Accounting enquiries which were made in the past. Prolonged engagement allowed the researcher to build a strong rapport with actors in Environmental Management Accounting, who are environmental managers, accountants as

well as engineers who facilitate obtaining of credible information about EMA in the extractive industries and mining sector of Zimbabwe.

Having considered validity and reliability issues in a qualitative design, the following section will look at the ethical consideration in research.

4.5 Ethical Considerations

Ethical considerations have important implications for the negotiation of access to people and organisations and data collection. The research design should not subject the research population to embarrassment, harm or any other material disadvantage. In this dissertation consideration was given to a number of ethical issues.

The benefits of the research are that its outcome will help the mining companies improve their environmental management in a way that is not only beneficial to the environment but which also brings profits to the implementing companies giving an advantage to companies trading in the global green markets. The importance of Environmental Management Accounting to the mining sector has been stressed and supported by the United Nations and the International Federation of Accountants. The researcher considered participants as partners and did not mean any harm to them. There is wide acknowledgement of diversity, personal beliefs and values and provided all participants in the mining sector an equal opportunity to participate. Informed consent was obtained from participants and it covers ethical issues such as anonymity and confidentiality. Informed consent provided vital information to the participants about the research which helped their decision to participate. The information contained in the consent form included benefits of the research, potential risks, purpose and procedures of the research and ensured that participation was voluntary and required written consent before participation.

An introductory letter outlining the purpose of the research and the institution to which the researcher is affiliated was given before any data collection commenced. The researcher also outlined the voluntary nature of participation, the right to withdraw from the research, anonymity of the participant, confidentiality of the participant's opinions and what would be expected from the participant.

The researcher did ethical clearance with the institution he is affiliated to (see approval attached in APPENDIX D1: University ethical clearance letter) before any data collection commenced. This is in line with proper research procedures which should be taken in research and also ensuring that all things are above board, at the same time giving credibility to the work of the researcher as he goes to the field for data collection. The participants in industry heavily rely on the university clearance letters

in order to release information for research purposes. The ethical clearance process took some time within the university from November 2015 to September 2016. The researcher also went through industry clearance with the Ministry of Mines and Mining Development. This is in accordance with the Research Council of Zimbabwe. The clearance request was lodged in January of 2016 and the approval was obtained in June of 2016, contributing to the slowness of data collection.

4.6 Summary and deductions

The research methodology chapter of this dissertation explained the research design which has been adopted for this study. A qualitative research design was adopted due to the nature of the objectives being addressed and the research questions which were being posed. For the overall execution of this research the specific research paradigm, approach and strategy and methods were given.

The overall methodology was based on the practical approach (pragmatic philosophy) to the research in Environmental Management Accounting. Considering the difficulties envisaged in the data collection process the researcher opted for methods which ensured that the required data would be obtained through ethical means**.** The study employed document analysis as a primary research strategy with a case study as supplemental and used a combination of data collection methods in order to ensure that the required data was valid and reliable to the readers as well as interested stakeholders. The research methodology was determined by what transpired during field work.

The next chapter presents data presentation, analysis and interpretation of the different data sets.

CHAPTER 5
ZIMBABWEAN MINING SECTOR PERSPECTIVE ON ENVIRONMENTAL MANAGEMENT ACCOUNTING

5.0. Introduction

The chapter presents survey data which was obtained in the form of questionnaires and interviews as well as secondary data in the form of sustainability reports and financial reports of mining companies. The data is presented in a systematic manner following the research objectives articulated in Chapter 1. This data analysis, presentation and discussion follows the research methodology and design given in chapter 4.

The data captures the Zimbabwean mining sector perspective on Environmental Management Accounting. The perspectives presented are based on the opinions expressed by experts in the mining sector in accordance with the research objectives. The data was analysed using descriptions and interpretations of themes which emerged during the analysis process using "Atlas.ti" qualitative data analysis software. The data was summarised in the form of tables, graphs and charts extracted by means of the software, showing the relevance of Environmental Management Accounting in the mining sector of Zimbabwe. The chapter covers eight sections, the demographics, promotion of sustainability, accounting systems, environmental costs and benefits, perceptions on the significance of EMA, benefits of implementing EMA, challenges in implementing and finally the role of accountants in EMA.

5.1. Demographics of Sample

The demographics are important to provide the context for the composition of the data analysed. The composition looks at the participant's gender, age, work experience and departments to which the participants belong in different companies. This helps to interpret data from the point of view of participants. 34 mining houses out of a possible 89 were randomly selected through a snowball sampling process. These companies are situated all over Zimbabwe. Questionnaires were distributed to these companies with an average of three questionnaires per company. A total of 72 questionnaires were returned out of a possible 100 which were distributed. A total of five interviews were done and ten sustainability reports and financial reports were analysed from ten different companies within the 34 companies group.

The participants from these companies occupied different positions as shown in Table 5.1 below.

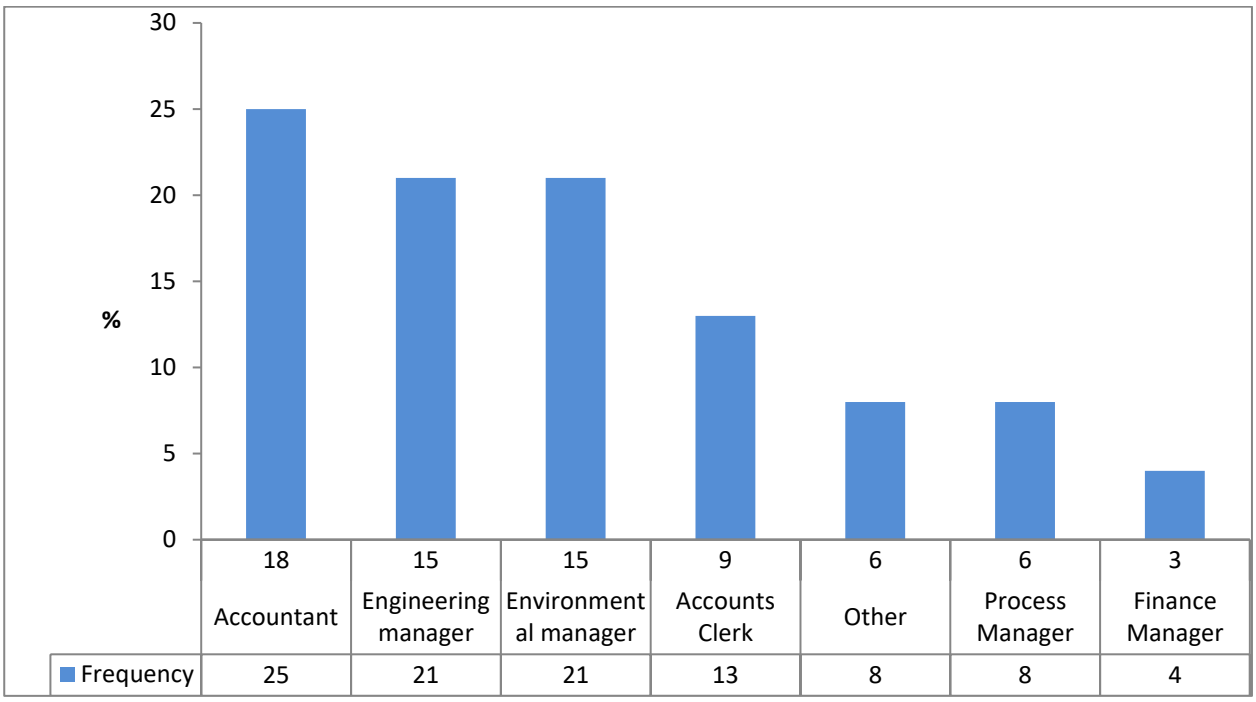

Figure 5.1 Job occupation (Profession)

Source: Author

Accountants comprised the majority of the respondents in this survey. This is indispensable for finding information relating to the role of accountants in Environmental Management Accounting in the mining sector and in finding their perceptions about the phenomenon under study. Engineering and Environmental managers contributed 21 percent of responses to provide a perspective from other professions to contribute insights to the area under study and possibly try to establish whether the professions can work together for the effective implementation of EMA. According to Sisaye (2006) there is a need for a coordinated effort from different professions for the effective implementation and development of EMA. Overall the people with an accounting background (accountants, accounts clerks and finance managers) took the highest frequency of a cumulative 41 percent, almost half of all the respondents. "Other" professions' opinions taken into consideration as indicated in Figure 5.1 above include risk managers, maintenance officers and planning managers in the mining houses.

A differentiate was made between respondents in terms of mining companies represented by the minerals/commodities they mine/extract and their regional locations. Table 5.1 below indicates the universum of minerals or mining area covered by the 34 companies represented in this study. The specific companies will not be identified for anonymity purposes.

Table 5.1 Structure of the mineral industry in Zimbabwe

STRUCTURE OF THE MINERAL INDUSTRY IN ZIMBABWE

Commodity	Major operating companies	Mine	Location
Chromite, Iron and steel:Ferroalloys, ferrochromium	Zimbabwe Mining and Smelting Co. (Private) Ltd. (Zimasco)	Lalapanzi, Mutorashanga, Ngezi,	Mutorashanga
Coal, Coke	Hwange Colliery Company Ltd.	3 Main Underground Mine	Hwange
Chromite, Iron and steel:Ferroalloys, ferrochromium	Zimbabwe Mining and Smelting Co. (Private) Ltd. (Zimasco)	and south of Shurugwi	Ngezi , Shurugwi
Gold	Metallon Gold Zimbabwe (Private) Ltd. (Metallion Corp.)	Arcturus Mine	Harare
Gold	Duration Gold Ltd. (Clarity Capital Group)	Athens Mine	Mvuma
Lithium	Bikita Minerals (Private) Ltd.	Bikita Mine	Masvingo
Concentrate, Smelter matte	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Bimha Mine	Chegutu
Refined metal	BSR Ltd	Bindura	Bindura
Gold	Blanket Mine (1983) (Private) Ltd.	Blanket Mine	Gwanda
Crude steel	NewZim Steel Private Ltd.	Blast furnace at Redcliff	Gweru
Coal, Coke	Hwange Colliery Company Ltd.	Chaba open pit mine	
Diamond	DTZ-OZGEO (Private) Ltd.	Chimanimani	Chimanimani
Coal	Coal Zimbabwe (Private) Ltd. [Steelmakers Zimbabwe (Private) Ltd.]	Chiredzi	Chiredzi
Diamond	Diamond Mining Corporation (Private) Ltd.	Chiyadzwa	Mutare
Coal	Coal Brick (Private) Ltd.	Coal Brick Mine,	Hwange
Cement: Clinker	Portland Holdings Ltd. [Pretoria Portland Cement Company Ltd. (PPC)	Colleen Bawn	Bulawayo
	Falcon Gold Zimbabwe Ltd. (New Dawn Mining Corp.)	Dalny Complex	Chegutu
Vermiculite	Dinidza Vermiculite Mining Co. (Private) Ltd.	Dinidza Mine	Dorowa
Phosphate rock	Dorowa Minerals (Private) Ltd. (Chemplex Corporation Ltd.)	Dorowa Mine	Mutare
Hydroxide, Refined metal, Nickel ,	Empress Nickel Refinery (RioZim Ltd.)	Eiffle Flats	Kadoma
Crude, rolled steel	Steelmakers Zimbabwe (Private) Ltd. (Steelmakers Ltd.)	Electric arc furnace, Rolling mill Redcliff	Kwekwe
Nitrogen (ammonium nitrate)	Sable Chemical Industries Ltd.	Electrolysis plant	Kwekwe
Coal	Makoma Resources (Private) Ltd.	Entuba coalfields	Hwange
Gold	Mwana Africa plc	Freda Rebecca Mine	Bindura
Gold	Duration Gold Ltd. (Clarity Capital Group)	Gaika Mine	KweKwe
Asbestos	African Associated Mines (Private) Ltd.	Gaths Mine	Mashava
Gold	Falcon Gold Zimbabwe Ltd. (New Dawn Mining Corp.)	Golden Quarry Mine	Shurugwi
Gold	John Mack and Co.	Golden Valley Mine	Gwanda
Portland	Sino-Zimbabwe Cement Company Ltd.	Gweru	Gweru
Portland	Lafarge Cement Zimbabwe Ltd. (Lafarge, S.A.)	Harare	Harare
Gold	Metallon Gold Zimbabwe (Private) Ltd. (Metallion Corp.)	How Mine	Bulawayo
Coke	Hwange Coal Gasification Company (Private) Ltd.	Hwange	Hwange
Gold	Pan Reef Mining Company (Private) Ltd.	Indarama Mine	Bindura
Chromite, Iron and steel:Ferroalloys, ferrochromium	Zimbabwe Alloys Ltd. (Zim Alloys)	Inyala Mine, Smelter	Gweru
Pyrite	Iron Duke Pyrites (GAT Investments (Private) Ltd.)	Iron Duke Mine	
Gold	Jena Mine (Private) Ltd. [Zimbabwe Mining Development Corp. (ZMDC)]	Jena Mine	Gwanda
Gold	F.A. Stewart (Private) Ltd.	Jessie Mine	Gwanda
Coal, Coke	Hwange Colliery Company Ltd.	JKL open pit mine	
Graphite	Zimbabwe German Graphite Mines (Private) Ltd	Lynx Graphite Mine	Karoi
Diamond	Kusena Diamonds	Marange	Mutare
Diamond	Marange Resources (Private) Ltd.)	Marange	Mutare

Diamond	Mbada Mining (Private) Ltd.	Marange	Mutare
Diamond	Zimbabwe Mining Development Corp. (ZMDC)]	Marange Chiadzwe	Mutare
Diamond	Anjin Investments (Private) Ltd.	Marange deposit Chiadzwe	Mutare
Diamond	Gye Nyame Resources	Marange deposit in the Chiadzwe	Mutare
Diamond	Sino-Zimbabwe Cement Company Ltd.	Marange deposit in the Chiadzwe	Mutare
Sponge iron	Steelmakers Zimbabwe (Private) Ltd. (Steelmakers Ltd.)	Masvingo	Masvingo
Gold	Metallon Gold Zimbabwe (Private) Ltd. (Metallion Corp.)	Mazowe Mine	Mazowe
Nickel : Ore, Ni content	Aquarius Platinum Ltd.,	Mimosa Mine	Zvishavane
Nickel : Ore, Ni content	Impala Platinum Holdings Ltd	Mimosa Mine	Zvishavane
Platinum-group metals: Ore, Cobalt: Ore, cobalt, Gold ,Copper:Ore, copper content , Nickel : Ore, Ni content, Concentrate	Mimosa Holdings (Private) Ltd.	Mimosa Mine	Zvishavane
Gold, Nickel : Ore, Ni content	Mimosa Holdings (Private) Ltd.	Mimosa Mine	Zvishavane
Chromite	Local cooperatives and small-scale miners	Mines on the southern and Northern Great Dyke	SN Great Dyke
Chromite, Iron and steel:Ferroalloys, ferrochromium	Zimbabwe Mining and Smelting Co. (Private) Ltd. (Zimasco)	Mining operations near Darwendale,	Lalapanzi
Phosphate fertilizer	Zimbabwe Phosphate Industries (Chemplex Corporation Ltd.)	Msasa plant	Harare
Platinum-group metals: Ore	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Mupfuti Mine	Chegutu
Diamond	Murowa Diamonds (Private) Ltd.	Murowa Mine	Zvishavane
Gold	Rio Tinto plc	Murowa Mine	
Cobalt: Ore, cobalt , Gold	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Ngezi Mine	Ngezi
Platinum, Nickel : Ore, Ni content	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Ngwarati Mine	Chegutu

Commodity	**Major operating companies**	**Mine**	**Location**
Gold	DTZ-OZGEO (Private) Ltd.	Placer mining Penhalonga	Mutare
Gold	Metallon Gold Zimbabwe (Private) Ltd. (Metallion Corp.)	Redwing Mine	Penhalonga
Gold	RioZim Ltd	Renco Mine	Masvingo
Iron ore	Essar Africa Holdings Ltd	Ripple Creek Mine	Kwekwe
Iron ore	NewZim Minerals Private Ltd.	Ripple Creek Mine, near Redcliff	Kwekwe
Diamond	Limpopo Minerals Resources Ltd	River Ranch Mine	Beitbridge
Copper:Ore, copper content	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Rukodzi Mine	Chegutu
Gold	Sabi Gold Mines	Sabi Mine	Sabi
Concentrate, Smelter matte	Zimbabwe Platinum Mines (Private) Ltd. (Zimplats Holdings Ltd.)	Selous concentrator, Selous Metallurgical Complex	Chegutu
Coal	Sengwa Colliery (Private) Ltd. (RioZim Ltd.)	Sengwa Colliery	Kadoma
Coal	Tulicoal (Private) Ltd. [Senzile Mining (Private) Ltd.]	Sengwa Colliery	Kadoma
Asbestos	African Associated Mines (Private) Ltd.	Shabanie Mine	Zvishavane
Gold	Metallon Gold Zimbabwe (Private) Ltd. (Metallion Corp.)	Shamva Mine	Shamva
Copper:Ore, copper content ,Hydroxide, Nickel: Ore, Refined metal	Bindura Nickel Corporation Ltd. (Mwana Africa plc)	Shangani Mine,	Harare
Vermiculite	Samrec Vermiculite Zimbabwe (Private) Ltd. (Imerys Group)	Shawa Mine	Dorowa
Chromite, Iron and steel:Ferroalloys, ferrochromium	Zimbabwe Mining and Smelting Co. (Private) Ltd. (Zimasco)	Smelter	Kwekwe
Iron and steel:Ferroalloys, ferrochromium	MonaChrome	Smelter at Chegutu	Chegutu
Iron and steel:Ferroalloys, ferrochromium	Maranatha Ferrochrome (Private) Ltd.	Smelter at Eiffel Flats	Kadoma

Iron and steel:Ferroalloys, ferrochromium	CINA	Smelter at Gweru	Gweru
Iron and steel:Ferroalloys, ferrochromium	Jin An Corp. and Xin Yu Mining Corp.	Smelter at Gweru	Gweru
Iron and steel:Ferroalloys, ferrochromium	Wel Mining	Smelter at Gweru	Gweru
Iron and steel:Ferroalloys, ferrochromium	Olliken Ferro Alloys (Private) Ltd.	Smelter at Kwekwe	Kwekwe
Cobalt: Ore, cobalt	Bindura Nickel Corporation Ltd. (Mwana Africa plc)	Trojan Mine	Bindura
Gold	Matebeland Minerals (Private) Ltd.	Turk Mine	Gwanda
Gold	Casmyn Mining Zimbabwe (Private) Ltd. (New Dawn Mining Corp	Turk-Angelus Mine	Bulawayo
Platinum-group metals: Ore, Cobalt: Ore, cobalt, Gold, Copper:Ore, copper content, Nickel : Ore, Ni content	Unki Mines (Private) Ltd. (Anglo Platinum Ltd.)	Unki Mine	Shurugwi
Gold	Artisanal miners, including small-scale miners and syndicates	Various locations	
Gold	Duration Gold Ltd. (Clarity Capital Group)	Vubachikwe Mine	Gwanda
Rolled steel	Lancashire Steel (Private) Ltd. [Zimbabwe Iron and Steel Company (Private) Ltd. (Zisco)]	Wire rod mill	Kwekwe

Source: Mobbs (2015)

As indicated in the previous chapters the total number of companies in the mining industry stretch up to 89 companies geographically dispersed all over Zimbabwe. These companies are involved in mining of over 40 different minerals which have been exploited to date (Coakley, 2002). The researcher did not concentrate on any specific minerals being mined because the study sought to understand the relevance of EMA across the extractive industry and mining sector of Zimbabwe. This helps to give a general guideline on how EMA is being developed and implemented all over Zimbabwe's extractive industries and mining sector.

The age groups of participants were taken into consideration to see how the generations within the age groups in which EMA was introduced across different mining companies are adopting the new accounting changes as opposed to the older generations. The age groups range are represented in the Figure 5.2 below. The educational and professional qualifications of participants were considered to have some level of assurance on the validity and reliability of information they were giving and to place reliance on the data obtained. Work experience was also of paramount importance because it gives an indication of whether the participants understand the companies' supply chain which is important to correctly answer questions relating to the subject under discussion. Information pertaining to educational qualification and work experience is indicated in Figure 5.3 and Figure 5.4 respectively.

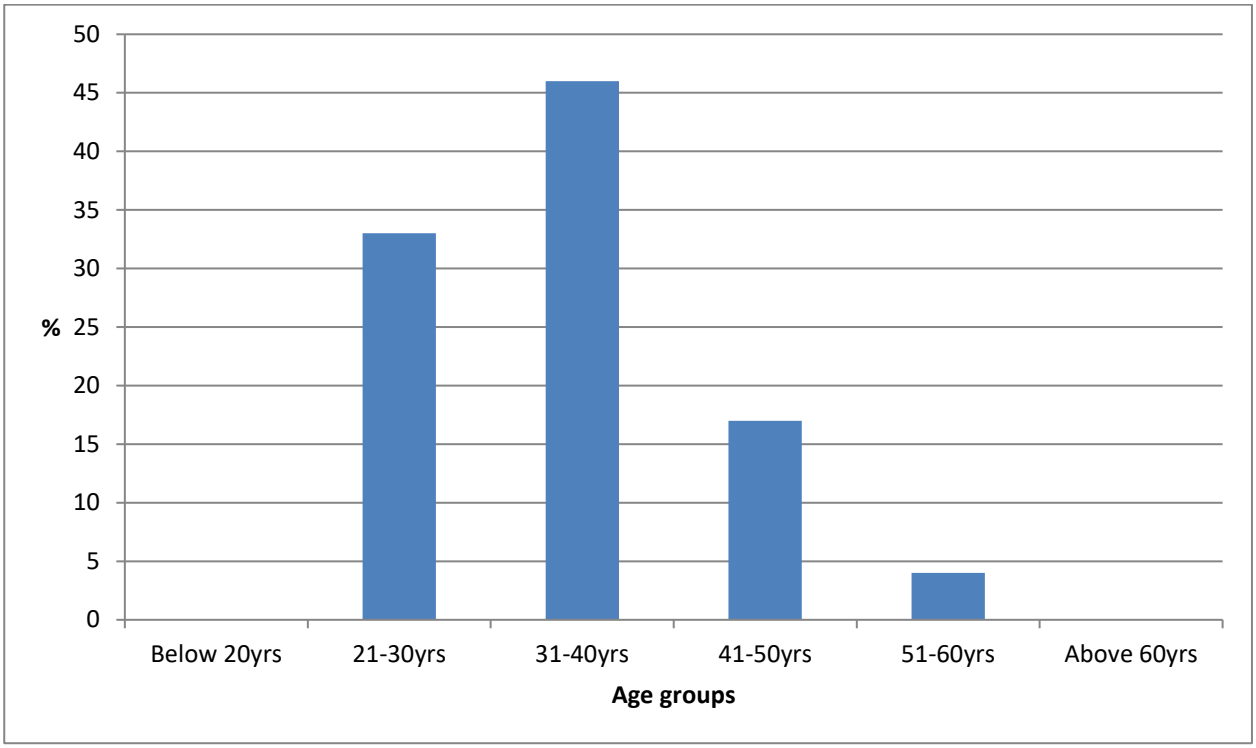

Figure 5.2 Age Groups

Source: Author

Most the respondents were within the 31-40 age group followed by the 21-30 year groups. Extant literature indicated that it is now close to three decades after the introduction of EMA (Christ, Burritt & Versei, 2016; Gunarathne & Lee, 2015; Islam & Deegan, 2008; Kamruzzaman, 2012; Schaltegger, Gibassier & Zvezdov, 2013) which might mean that, the age group within the 31-40 years will be best able to comprehend the new phenomenon which was introduced within their generation different from the ages beyond 50 years. Later in the chapter the researcher gives an account of how these age groups explained EMA in relation to accounting for environmental issues. Gender was not equally distributed within these age groups with more males (96 percent) than females (four percent). This is attributed to the nature of the industry which attracts more males than females because of the risk associated with the industry. However, there may be perceptions about risk, this level of inequality may be construed as an impediment to changing attitudes about EMA. The gender distribution is shown in a pie chart Figure 5.3 below.

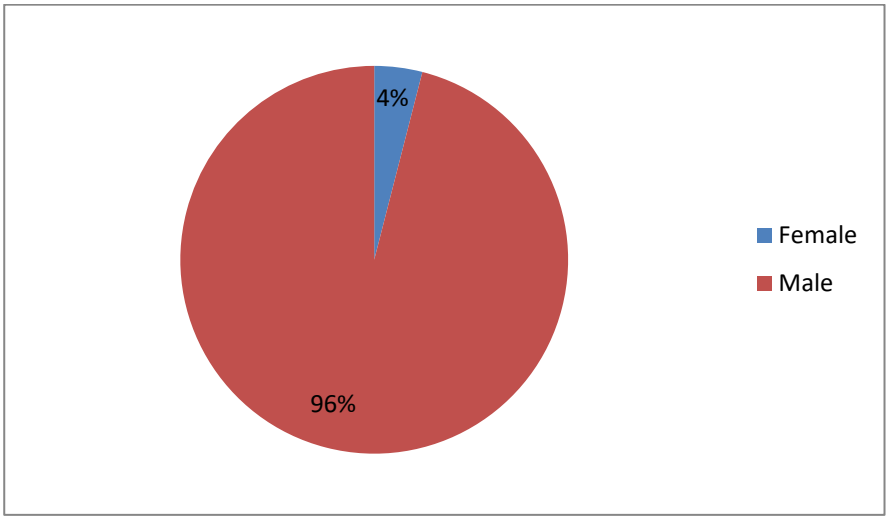

Figure 5.3 Gender distribution

Source: Author

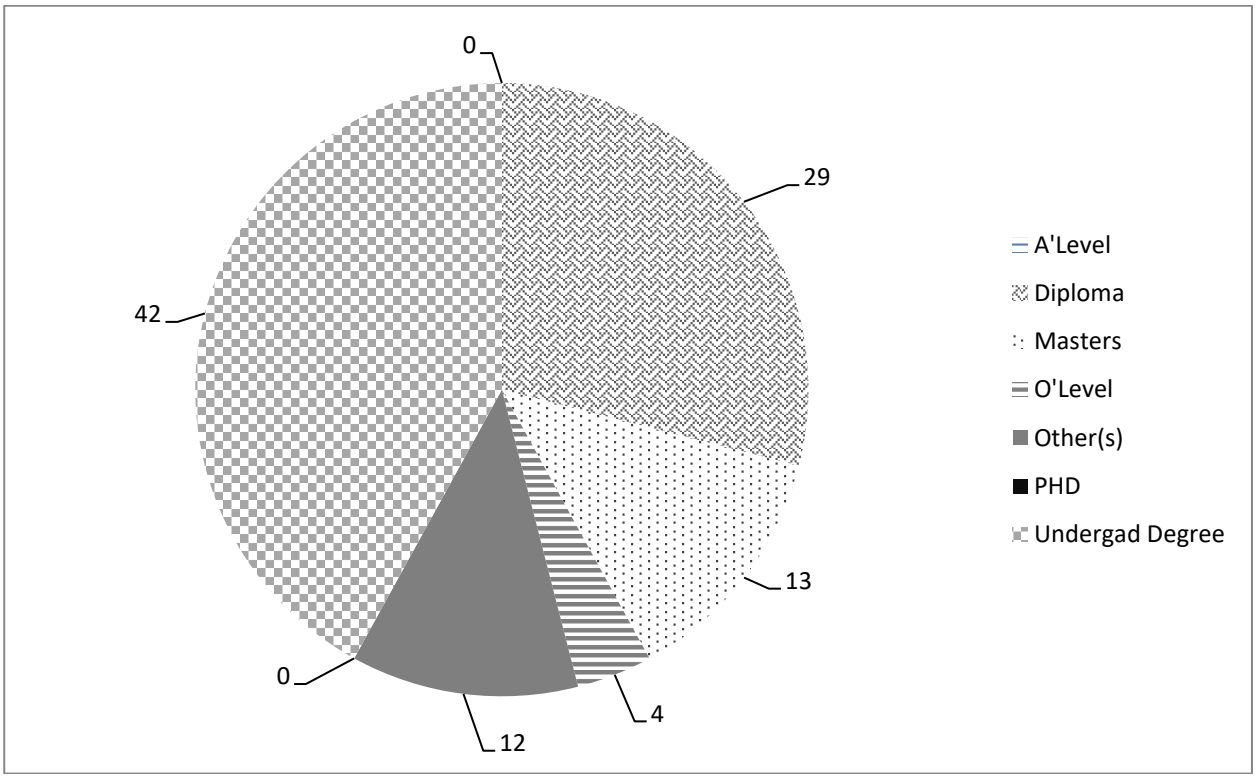

Figure 5.4 Educational/professional qualifications

Source: Author

42 percent of the respondents and 29 percent of the respondents hold undergraduate degrees and various diplomas respectively. This indicates the level of literacy of the people who responded to the questionnaires. This enhances the validity and reliability of the data collected. Generally, all the people who participated had the minimum expected qualification of ordinary level. Environmental Management Accounting is a complex subject (Gray, 2010b; Russell & Thomson, 2009) which

requires some level of education to be understood, therefore the study sample which participated in this research were above the expected minimum educational levels. The category "Other(s)" represent 12 percent of participants. This includes people with various professional qualifications in safety, healthy and occupational hazards. Professional accreditations include ACCA (Association of Chartered Certified Accountants), CPA (Certified Public Accountants), CIMA (Chartered Institute of Management Accountants), CAs (Chartered Accountants), Engineering professionals, Metallurgical and other such related professionals.

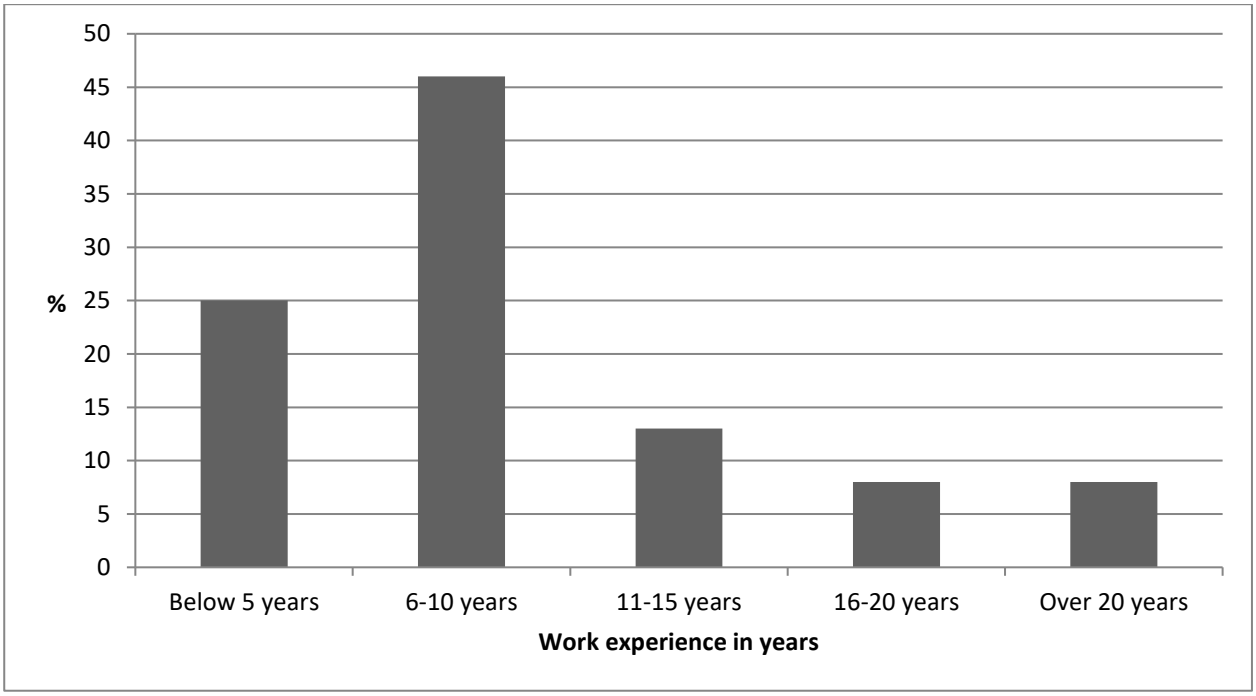

Figure 5.5 Work experience in years

Source: Author

Work experience ranges from zero to twenty years, with most participants in the 6-10 years' age group. Experience in the mining and extractive industry is very important to understand the physical flow of information which will feed into the accounting systems. Without much experience in the sector it will be difficult to effectively contribute to the subject matter of this research. It must be noted that there were individuals with over 20 years of experience who participated in this study, given the view presented above the older respondents may have views different from that of younger respondents.

The themes formulated out of the research objectives and research questions were analysed, interpreted and discussed in the following section.

5.2. Findings on the Promotion of Sustainability

One of the study objectives (Research Objective 1) of this research was to explore how EMA promotes sustainability in the mining and extractive industries of Zimbabwe. This was achieved through seeking opinions of the people who are involved in Environmental Management Accounting or seemingly accounting for environmental related issues in different companies within the mining sector. Professionally qualified people gave their different opinions through the survey which was conducted and below are the analysis and discussion of the results obtained.

The respondents indicated that they are aware of sustainability in the mining sector. Sustainability has been defined in the literature in various ways depending on the setting (Gunarathne & Lee, 2015; Schaltegger *et al.*, 2013). In the extractive industry, mining has been defined as unsustainable (Azapagic, 2004; Mtisi *et al*., 2011) in all aspects and the argument was that mining is unsustainable by implication as it involves unrepairable damage to the environment (Murombo, 2013). It, however, makes more sense to explain mining sustainability in the context of economic development and growth rather than environmental development. The respondents gave their opinions on what they took mining sustainability to be in line with their activities. 87 percent of the respondents indicated that they are considerate of mining sustainability and their explanations for this view were varying. 13 percent of the respondents were not aware of mining sustainability. The divergent explanations which were given on what participants thought mining sustainability is, in line with the extant literature, indicated mining sustainability is its ability to preserve the environment for future generations and at the same time ensure that the present generation equally benefit from the natural resources (IFAC, 2005; United Nations, 2001b). 80 percent of the participants who indicated that they are aware of mining sustainability could explain and/or define the term while 20 percent did not indicate precisely what mining sustainability entails. These explanations are set out in the following subsections which also provides information whether the implementation of EMA will improve the running of mining companies on a day-to-day basis. Running of mining companies is considered under this section because it is a major contributing factor to mining sustainability.

5.2.1. Mining sustainability

Mining sustainability in Zimbabwean mining companies has been explained by respondents in terms of the themes of profitability, industry maintenance/productivity, preservation for future generations, environment conservation, Optimum utilisation of resources, avoiding negative impacts, social considerations, environmental impact assessments, rehabilitation ability and new systems development.

Profitability: Most respondents explained mining sustainability within the context of profitability with minimum environmental impacts. One responded defined it as "*Avoiding wasteful mining and processing and to the best extent possible, minimising the footprint of negative impact, that is, contamination of soil, water, air and creation of effluent in the form of solid, liquid and gas''*(P 67:8*)*. Profitability is recognised as a measure that a company is going to continue in existence for the foreseeable future, under the going concern assumption principle, which is an indication of how the company is being sustainable and that a company can sustain its operations (Lamberton, 2005; Schaltegger *et al.,* 2008). Profitability alone as a measure of how a company is sustainable is not enough; there is need for a balanced view on how the mining sector can be sustainable. The financial performance in the form of profitable mining activities as part of mining sustainability is in line with a theme which was developed and which was prominent in literature (see section 1.10.2), that is, viability of the mining industry with the ability to contribute positively to the economy and industrial growth.

Industry maintenance: The theme has been cited several times as part of mining sustainability which entails the ability to keep and maintain the mining industry viable. The maintenance includes keeping the mining companies updated with the latest models of technologies and techniques of doing business. Industry maintenance has been discussed as include activities such as capital injection, plant maintenance. Industrial maintenance in some cases refers to the repairs and upkeep of different types of equipment which is used in mining operations. There have not been many cases in literature, (scarce literature) in which industry maintenance has been mentioned as part of mining sustainability. Staniskis & Stasiskiene (2006) posits that effective and efficient maintenance in general are not just desirable, but fundamental to profitable business operations and plan maintenance is a high priority to plant managers in pursuing of sustainable businesses. Literature emphasised on capital maintenance and plant maintenance as opposed to industry maintenance (Rambaud & Richard, 2015).

Environmental conservation: Environmental conservation plays a major role as part of mining sustainability, since most of the operations of companies in the mining sector includes irreparable damage to the environment (Schaltegger *et al.,* 2008). Environment conservation takes into consideration the fauna and flora (Schaltegger *et al.,* 2008), which has been indicated in literature as difficult to maintain in areas where mining activities takes place unless rehabilitation is done. In support of this argument, Wells *et al.,* (2003) argue that since mining takes place in areas where minerals occur, it is impossible to move mining to areas were mitigation can be controlled. Rehabilitation of affected areas requires huge capital injection back to the project (EY, 2014) and it is also difficult to replace the natural fauna and flora back to their original state before the mining activities started (Lamberton, 2005; United Nations, 2001a). Literature reveals that environmental

conservation is a difficult task which companies in mining are faced with. The conservation also includes avoiding wasting resources thus maximum or optimum utilisation of resources, reducing harmful raw materials which can go into the processes. These might include water, energy, pollution in the form of burned fossils and gas smoke.

Mining sustainability has also been explained under the broad context of sustainability coined in the Brundtland definition of sustainability (WCED, 1987) as mining which ensures that the future generations can benefit from the same resources which are benefiting the current generation, or putting in place systems which ensure that all generations have equal opportunities to use the resources of the country. As one respondent put it across, *"mining sustainability is extracting and processing resources in such a way that the future generations can also benefit from the same resources".* Thus, in other words, as another responded said, *"mining sustainability ensures that current mining operations does not in any way affect the future mining operations and programmes or compromise the ability of the future generations to continue with economically sustainable mining operations"*. The needs of the present generation should be met without compromising the ability of the future generations to perform similar activities. This is an obvious indication that the mining activities should be in harmony with the environment by avoiding negative environmental impacts.

The serious consideration of social impact of mining, environmental impacts and economic impacts has also been given as an indicator of mining sustainability (Ambe, 2007; Bennett *et al*., 2004b). The moment all the three pillars of sustainable development are taken into consideration in mining it entails that sustainability has been achieved. But what is not clear is how the three facets of sustainability come into synchronisation. The respondents indicated that the consideration of the needs of the communities surrounding mining areas is a very important social activity, this was achieved in about four percent of the mining companies which are in areas where the social livelihoods of people were affected through the indigenisation and empowerment policies in which mining companies were required to give ten percent of their proceeds to the communities through share ownership trust. This helps improve the lives of people in areas affected by mining activities. The impact of mining activities on the communities in which the activities are conducted has been well document in Zimbabwe (Nyoni, 2016).

Environmental Impacts Assessments (EIAs). The other explanation boarders around the process of environmental impacts assessments (EIA) which are carried out before any mining activities are done. The recommendations of the EIA will be operationalised or acted upon by mining executives. The EIAs ensure that the harmful activities of any mining operations are reduced or kept at a minimum level. The reasons the environmental impacts are not eradicated is that there are no possibilities of

completely taking away the harmful nature of mining activities. EIAs on their own are an indication of sustainable mining. That is, EIAs are done within the required time and checks and balances are effected to ensure adherence to the expectations of the regulatory authorities, who require that the EIAs be carried before any mining activities are conducted (Ashton *et al*, 2001). The EIA reports have sections which deals with the rehabilitation of mining sites once the mining activities are completed and how companies propose the rehabilitation after extraction of mineral resources (Ashton *et al.*, 2001). The rehabilitation programmes are in most cases heavily controlled by the government which keeps the rehabilitation funds. These funds have been abused by the government which end up not rehabilitating the used-up mines (Murombo, 2013). Cases study from Zimbabwe - Shabanie mine in Zvishavane has developed into acid drainages and one from Johannesburg (South Africa) where gold mines are inundated with the same acid water drainages causing health hazards to the communities (Murombo, 2013; The Financial Gazette, 2016). The moment mining companies can adequately fund the rehabilitation account to the tune of the amount indicated in the EIA reports and various government regulations, then rehabilitation can be carried out. Literature provides examples indicating how rehabilitated mining areas can be improved (Schaltegger *et al.*, 2008). In Zimbabwe we have a case of a successful rehabilitation programmes in the Zvishavane area which used to be mining town but was turned into a university campus after mining operations were closed due to mineral underground resources depletion. The town was slowly becoming a ghost town with most of the mining workers moving out of the town to other areas in which they could find employment. The town was then turned into university student accommodation. This can be recorded as an accidental successful rehabilitation programme because it was not planned. What is not clear about the specific area which was turned into a university is why the underground mines far from the community were left open, becoming the breeding areas for mosquito and other related diseases. Rehabilitation programmes come in different forms such as land reclamation and building of parks and reforestation.

New systems development: The final theme in mining sustainability comes in the form of companies that can utilise technology to come up with systems or developments which integrate the reduction of environmental impacts and technology. The systems include EMA systems and other management techniques which are peculiar to the mining sector. Schaltegger *et al.*, (2008) argues that the mining industry could improve the accuracy of its reporting structure through rigorous costing processes which can only be brought up through the implementation of environmental accounting. Speaking of these techniques leads us to the next topic for consideration, which will look at whether the implementation of EMA will improve the running of mining companies on a day-to-day basis. Figure 5.6 below summarises the themes which were discussed in this section in line with how grounded

they were in the survey. The term "groundedness" in "Atlas.ti" refers to the number of times or the frequency in which a certain theme came out of the survey.

It is imperative to note that in this survey a gap was observed in which mining sustainability was never explained in terms of accounting systems considerations which can help in achieving the overall sustainability of the sector. The closest theme to accounting systems development which might also encompass EMA systems is the new systems development concept. This was followed up with interviews to understand what the respondents were referring to when they mentioned the new systems development. The new systems developments according to the interviewees were concerned with any system which cater for environmental or sustainability measurement, accounting and reporting at the same time as being able to handle day-to-day traditional accounting aspects. The systems should be integrated with plant-wide systems of other departments to ensure that comprehensive integration of accounting activities and other department activities is achieved. It was clear that accountants and finance managers involved in the production of financial statements believed mining sustainability must be concerned with the way companies in the mining sector respond to the environmental impacts and their ability to ensure that future generations benefit from the same resources that the current generation is benefitting from.`

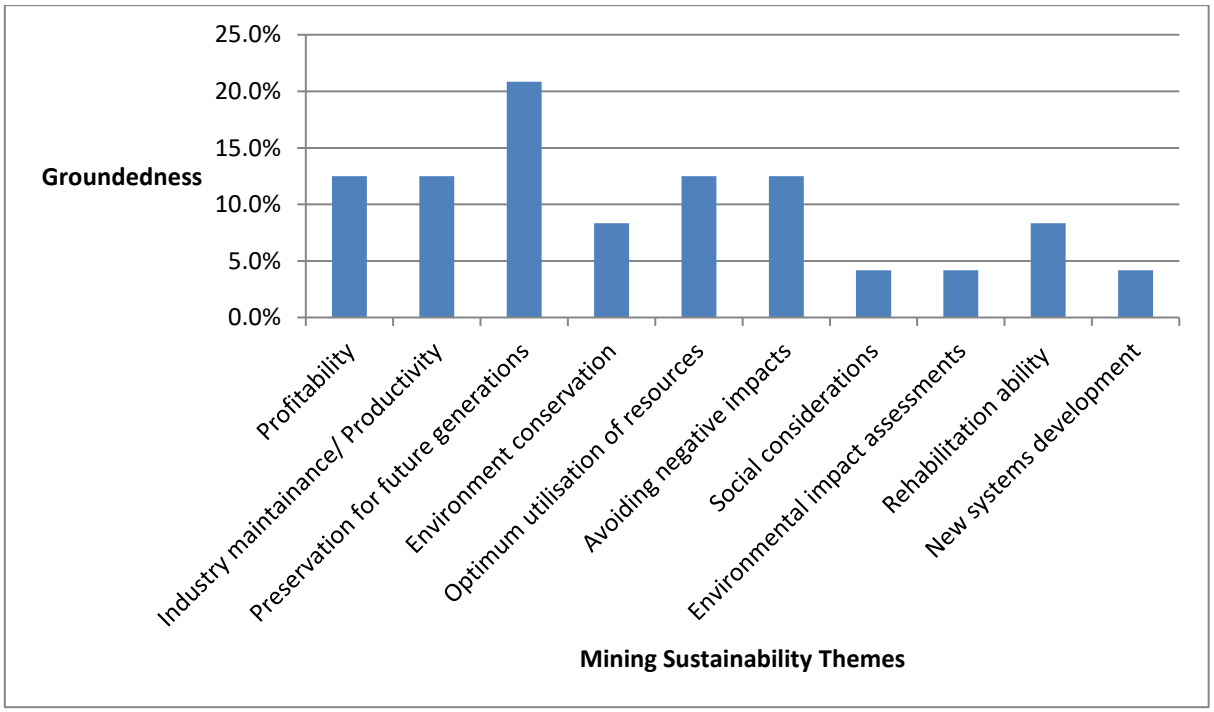

Figure 5.6 Mining sustainability themes[3]

Source: Author

[3] Refer to Appendix A: Questionnaire Section B Q1

5.2.2. Running of mining companies

The major concern of EMA as given by the United Nations Department of Sustainable Development (UN DSD) is to ensure the operationalisation of EMA on a day-to-day basis. Opinions were solicited on whether the implementation of EMA will improve the running of mining companies in line with the UN DSD expectations as given in the EMA policies and procedures framework (United Nations, 2001b). It was observed that EMA improves the running of mining companies if implemented This was indicated by 92 percent of respondents who gave a positive indication and four percent of the respondents were either not sure, or not aware of the influence of EMA on company performance and running of mining companies' improvement on a day-to-day basis. The results are indicated in Figure 5.7 on a pie chart below.

It is necessary to shed more light on the reasons behind the argument that 92 percent of the respondents pointed out the implementation of EMA as a basis for improving the running of mining companies on a day-to-day basis. The mining executives argue that the moment something must be accounted for, it receives constant attention, that is, constant reviews, audits, improvements and feedback to the stakeholders to whom accountability is owed. The argument of respondents is supported by Schaltegg*er et al*, (2008) who argues that accountability brings transparency and constant reviews in EMA. This entails the development of accounting parameters, be it environmental accounting specific reports which must be produced indicating the amount of money spent, the revenues generated and the social benefits in line with the implementation or expenditures relating to certain activities. The process, in the end improves the way business is done. Companies will tend to be more open and attentive to environmentally related issues which are important in mining business for survival in harmony with the surrounding communities and other different stakeholders. A conscious consideration of EMA will improve the running of mining companies on a day-to-day basis although it comes at a cost. This is explained in the section 5.4. If companies are to improve environmental performance, implementation should be mandatory with a systems which account for the physical flow of environmental information as well as the monetary flow to achieve the goals which are mutually beneficial to the company and the stakeholders in the mining sector. Gray, (2010b) and Jones, (2010) support this in literature by saying EMA systems in the mining industry should be mandatory for them to be effective, although it is largely documented (see for example, Luther, (1996)) that there are no mandatory regulation to support the reporting and disclosure of environmental management accounting in the extractive industries.

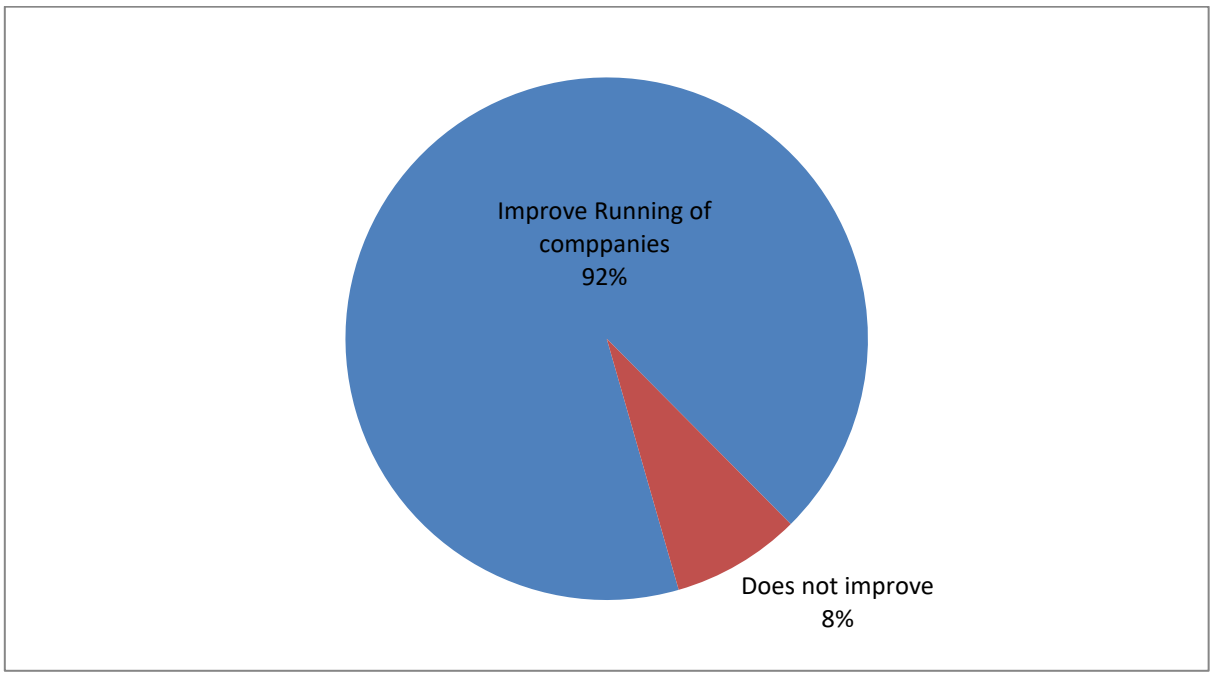

Figure 5.7 Improvement in running of companies[4]

Source: Author

EMA implementation in anticipation of improving the running of mining companies has been viewed as a trade-off between production and conservation (Christ, Burritt & Versei, 2016). In some instances the implementation may improve and in some instances it may not improve. There is no universal application of EMA which has proved that it helps improve the running of mining companies if implemented. In developing countries like Zimbabwe running of mining companies through EMA might not work whereas in developed countries it might work as Kumah, (2006) posits in reference to developing countries (see section 2.2.3 and 2.2.4). Respondents indicated that, the application of environmental accounting in some instances might constrain the running of certain activities which are needed for optimum production. Empirical evidence in the application of the concept and heavy investment in different types of technology which can check all variables which are needed to achieve a win-win situation in the mining industry are needed not to compromise mining operations (P 73:9).

The implementation of EMA has been seen in this survey as assisting in the spreading of environmental costs in the long run instead of accumulating costs at the closure of the mines. According to literature, companies in mining usually find themselves in huge lawsuits (or litigation costs) (Sinding, 1999) in which they will be required to account for environmental damages which their rehabilitation funds will not be able to cover, but the existence of EMA systems will allow companies to account for these costs on a yearly basis and review such costs in line with changes

[4] Refer to Appendix A: Questionnaire Section B Q2

which will be happening in the economic environment (Mohr-Swart, 2008). The lack thereof will come as a wakening call to the companies once they are about to reach the end of the life of a mine or closure of their operations. It has been revealed that some companies end up losing their licences or going out of business due to failure to account for their mine closure costs and rehabilitation funds criteria. This point leads to the accounting systems considerations which are discussed in section 5.3 below.

5.3. Accounting Systems

The researcher sought to understand whether the current accounting systems address the three pillars of sustainable development. The exploration of this helps the research to answer the question whether EMA promotes sustainability in general in which the pillars of sustainability help address the contribution of EMA towards sustainability. Data is displayed showing the 'groundedness' of responses' to the three pillars (which are economic issues, environmental issues and social issues) and how they are addressed in the company's accounting systems of different participants. The data obtained is given in Figure 5.8 below.

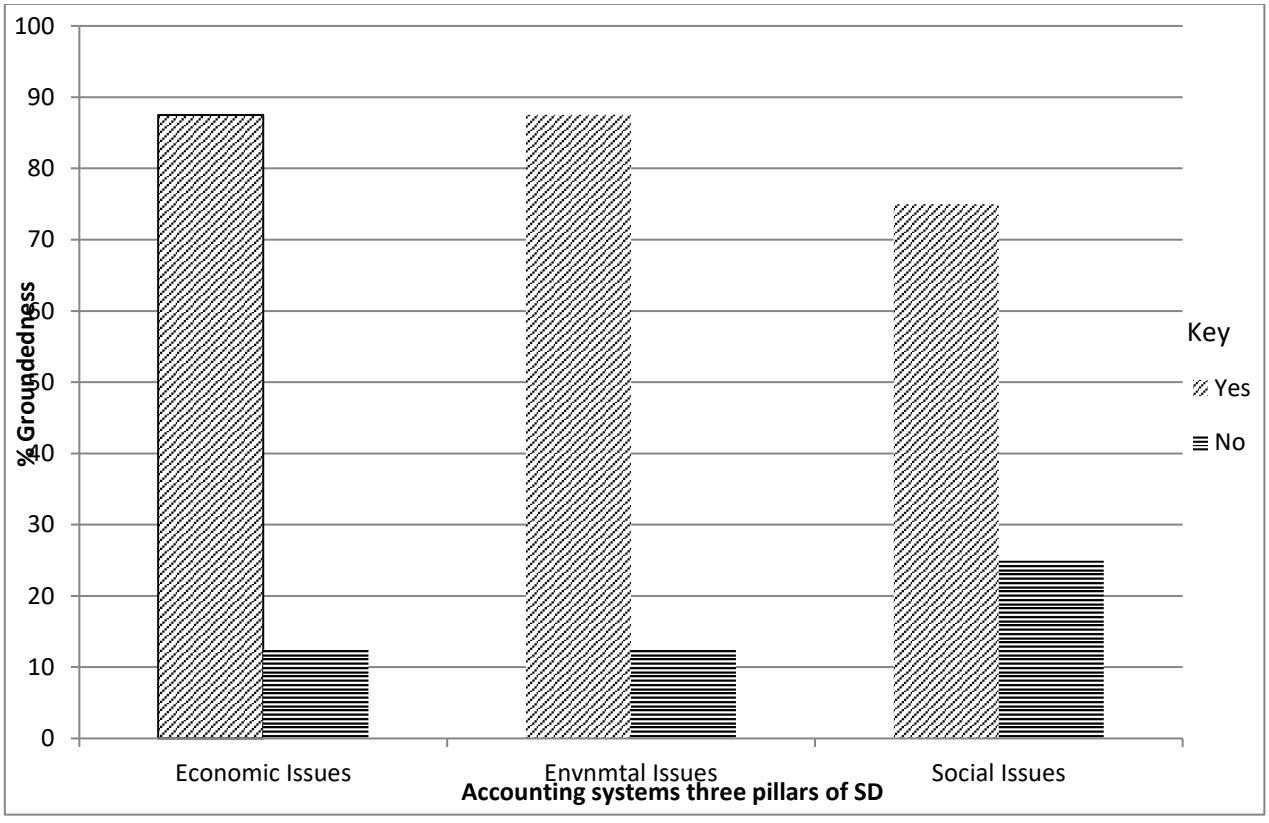

Figure 5.8 Mining companies' accounting systems' contribution to three pillars[5]

Source: Author

[5] Refer to Appendix A: Questionnaire Section B Q3

Figure 5.8 indicates that 88 percent of the companies represented in the survey have the three pillars of sustainability being addressed in their accounting systems with less than 20 percent indicating that the three pillars are not being addressed. One of the pillars of sustainability (social pillar) came out as the least addressed in terms of the companies addressing the pillars. Figure 5.8 also indicates a less favourable result for the social pillar. However, the social pillar is the most difficult to present in the accounting systems. This is in line with literature which indicates that social issues are difficult to address in monetary terms unless they are recorded under company social responsibility costs (Burritt & Schaltegger, 2010).

It is relevant for fulfilling the research objectives to check how these three pillars of sustainable development are being addressed in companies' accounting systems, the extent to which these three pillars are addressed as indicated in the EMA definition put forward by UN (United Nations, 2001a) correlates with the extent to which sustainability can be achieved. Though literature indicates that total sustainability is a myth, steps towards its achievement are commendable (Gray, 2010b). The definition put forward by UN and other scholars addresses all the three pillars of sustainability which might make EMA a good sustainability indicator.

5.3.1. Economic pillar

The accounting issues addressed within each specific pillar were organised into themes to make the analysis easy. The following paragraphs will cover the different themes which emerged. The themes were analysed following the three pillars of sustainable development as outlined by the sustainable development goals (IFAC, 2005; United Nations, 2001b). The three pillars, according to the respondents, "*are an integral part of the company's life-of-mine plan, five year plans, derivative operations, accounting and reporting, down to the monthly levels and day to day operations"*.

The respondents indicated that, the three pillars encompass every activity and operation of the organisation without specifically mentioning or pointing to any activity. The moment budgets are crafted and financial reports are produced for decision making purposes, it's an indication of the application of economic aspects of sustainability. The environmental aspects as well as the social aspects are represented in non-monetary terms using environmental reports, sustainability reports and the corporate social responsibility (CSR) system which the companies engage in from time to time. These activities are then recorded in monetary terms indicating the cost outlays or expenditures done to achieve the CSR activities.

The economic pillar covers the economic performance of the company and includes financial performance and ultimately an organisation's wider impact on the economy (IFAC, 2011). Economic performance reviews are conducted periodically in many mining companies to check if the targets

are met and objectives of a specific period were met. This is basically doing variance analysis comparing the actual performance against the targets and taking corrective action if there is need. Coupled together with economic performance reviews is the analysis of costs, savings, earnings and benefits in monetary and physical terms. This help companies in production of different types of reports which feed into management decision making processes. The economic aspects can be measured in terms of the industry contribution to the GDP or the profit of a company contribution to the sector. In addition, the economic pillar allows organisations to recognize profitability, growth, job creation and tax generation for government. The economic pillar is a good indicator of company performance and how the different economic issues are being addressed.

The respondents indicated that the economic pillar is inherently part of the accounting system as everything from the capturing of the transaction to the production of different types of reports makes a direct contribution to the economy at a micro level and macro level. The economic assessments may come in the form of audits which are conducted to check different things like adherence to control systems put in place to give assurance to the stakeholders that the financial statements give a true and fair reflection of what is happening in an organisation. The respondents also indicated that the economic aspects are broad. There are issues to do with the International Standards Organisation (ISO) 14001 of 2015 certification which caters for good environmental management systems which companies record as being part of economic issues addressed in the company accounting systems.

The rehabilitation account has been given by respondents as one versatile account which mining companies keep track of because it records and caters for all the three pillars of sustainable development. It is mandatory within the accounting fraternity for companies as stipulated by the International Financial Reporting Standards 6 (IFRS 6) (IASB, 2010a, 2010b) to have the rehabilitation account. What is not clear is how the account directly contributes towards sustainability or how the account links the economic, environmental and social issues to achieve sustainability of the sector. Some companies make specific provision in the rehabilitation account and use the account as a reserve account just like how the asset depreciation account works. The funds are set aside on a yearly basis until the life of mine period is reached and the funds are recouped to fund the rehabilitation.

In cases where the economic issues were considered as part of the organisation accounting systems the respondents recommended that companies should be involved in costing all the activity categories to enable costs related to different activities to be accounted for properly rather than being lumped together in overheads.

The three pillars of sustainability are difficult to separate, let alone give a specific answer to how they are being addressed in the accounting systems of the company because they are inter–linked. The interaction among the three is witnessed through, for example, corporate social responsibilities which many companies in this industry are involved. The CSR programmes are social, economic and environmental in nature: social in the sense that the communities in most cases benefit from these programmes, and economic in the sense that resources are mobilised to cater for these programmes, which means money is used and become part of an organisation's expenditures. Environmental is not clearly addressed particularly in this scenario but there are instances where the CSR goes on to take care of the environment in rehabilitation of waste lands, creating habitable cities, clean up campaigns (awareness campaigns) and many more activities and this goes back to both the environmental and economic aspects which are measured in monetary terms, that is, the amount of money spent on environmentally related activities. CSR programmes help in creating employment and coming up with waste management systems which help in fighting environmental externalities which organisations do not have control over long after the mining activities are closed. As part of CSR some organisation pay school fees for students and record this as having an economic impact in the country literacy levels and also in reducing the government expenditure on school fees.

Provisions for environmental costs and liabilities was the major economic aspects of sustainability which is addressed in the accounting systems of different companies. The provisions are made in the financial statements as funds which will be set aside for future costs. The provisions are very important, with a dire need to check whether the actual movement of cash is being effected periodically

Cleaner production techniques are being employed in the sector. This helps in reducing the amount of waste produced during different mining processes from one department to the other in different mining companies. The cleaner production techniques are expensive to develop and implement and they require huge capital injections which have serious impacts on the revenue of the mining companies. The impacts fall under the economic issues of the companies as part of the accounting systems. Every move that is being made towards sustainability has a bearing on the economy and eats up the revenue generation ability of the company reducing the GDP of the country at large. The economic growth focus of many companies takes all these into consideration and comes up with a reasonable expected economic growth contribution of the sector' this is evident from the financial reports and sustainability reports of different companies sampled.

5.3.2. Environmental pillar

Closely linked to economic issues as indicated in section 5.3.2 are environmental issues which have a huge bearing on the expenditures of mining companies. The implementation of the rehabilitation projects is environmental in all aspects and these are recorded in physical terms as opposed to monetary. They in turn feed into the monetary aspects of accounting. The rehabilitation projects largely become part of sustainability and environmental projects. According to the respondents, the environmental aspect is prominent in the sector. Companies have full-fledged departments which cater for the environment and the major one is the safety, health and occupation department, which ensures that all environmental aspects are taken into consideration that is, taking care of the environment from the harmful nature of the operations and being careful of the possibilities of living in an endangered environment. The environmental issues cannot be quantified except if they can be expressed in monetary or physical terms. The respondents indicated that this quantification process is cumbersome and difficult, especially considering the environmental externalities which many companies cause and not accountable for because they are offset against environmental permits and expected environmental pollution limits.

ISO14001:2015 (Environmental management) is part of the environmental aspects which environmental departments take care of, together with ISO 14006:2011 which focuses on environmental systems. The environmental subsystems standard is a supporting standard of environmental management which EMA falls under as a supporting system for environmental management. The departments are heavily funded to avoid environmental compliance shortfalls which usually result in enormous penalties and liabilities.

There were instances where environmental issues were indicated not to be covered by the accounting systems of the companies and a considerable number of people indicated that to address the environmental aspects of sustainability the implementation of EMA will ensure that a more detailed evaluation of environmental costs, liabilities, revenue and other related information is provided timeously for decision making purposes, since these are not adequately covered by the conventional or traditional management accounting systems. In addition, waste management systems which are being introduced are part of the company's environmental accounting systems. The availability of a robust accounting systems come with accountability responsibility for companies. This responsibility is covered under the social pillar discussed in the following subsection 5.3.3.

5.3.3. Social pillar

The social pillar is an integral part of doing business in the mining sector. This is usually visible in the engagements which are done with the community and the efforts done by companies to improve

lives of communities surrounding mining areas. The social issues are not clearly visible in the accounting systems according to respondents and this has been debated in literature (see for example, Bebbington, 2014; Gray, 2010b, 2013) that it is not easy to include social issues as part of the accounting systems to achieve sustainability. Efforts can be made to represent social issues in the form of expenditures made towards achieving company social goals. The social issues go beyond monetary issues as they contribute to the lifelong impact on community which is difficult to measure in monetary terms.

The researcher sought to understand the magnitude with which the social issues are addressed in the company accounting systems. The prominent explanation from respondents indicated that social issues are addressed through the recording of expenditures related to the social engagements with communities which include giving psycho social support services to workers and the general community at large. These services are not paid for by the workers but are allocated a budget every year with costs charged to the specific cost centre every time a service is offered. The costs are allocated to different departments on *pro-rata* basis. The sustainability reports and financial reports had strong indication of these psycho social services in narratives. The monetary aspects were not clearly visible. The unavailability of the monetary aspects of social costs in financial reports and sustainability reports indicate that social aspects are usually better represented in physical form (or narratives) rather than in monetary terms.

Study participants also pointed out to awareness campaigns (including HIV/AIDS campaigns) which are done as part of the social pillar of sustainability. The costs related to different campaigns are covered in the financial statements in both narratives and financials. The only complication comes when activities are done without spending money. These are not recorded in the accounting systems but in the sustainability and environmental reports together with the financial report disclosures to give a fair view of the company's social responsibilities. Gray, (2010) argues that financial accounting on its own will not give a fair presentation of sustainability issues. Financial accounting need to be supported with notes which can be in form of sustainability reports to enhance corporate disclosure. Other organisations indicated corporate social responsibility accountability as a platform for addressing the social issues in the accounting systems of the company. This will be in the form of cash outlays towards corporate social responsibility, thereby contributing to the economic aspect of sustainability. The social issues constitute doing business responsibly, and using cleaner production techniques (reduce environmental waste). The companies will be showing that they care for the surrounding communities and proving to be good citizens living in harmony with nature and humans not overlooking the underlying ultimate profit making goal.

Rehabilitation programmes mentioned in section 5.3.1 contribute indirectly to the social pillar, because communities will have access to a habitable and health environment. The social aspect of this nature takes time to be enjoyed by communities. Companies participate in the municipal responsibility of building housing, social amenities and schools as part of social considerations. These costs in building social amenities are largely visible in financial reports as part of social costs. Although the financial reports did not have a distinction of these specific social costs, they are mainly represented in the integrated reports and the sustainability reports as part of social consideration. The company policies promote corporate social responsibilities with dedicated budgets towards the sustainable social issue.

As indicated in Figure 5.8 above, 25 percent of respondents indicated that the social issues are not addressed in the accounting systems of the company and recommendations were given about costing all activities which are socially motivated to come up with a sum of the expenditures directed towards social issues to have an idea of how much is being contributed towards sustainability, although the majority could not suggest what can be done to address the social issues in the company accounting system. The other reason social issues are not being addressed is that they are not measurable and cannot be quantified in monetary terms with ease but they can be summed up qualitatively through reports or notes to the financial statements, but a monetary value cannot be placed on every social contribution by the company.

5.4. Environmental Costs and Benefits

The study sought to understand the opinion of the respondents on whether the implementation of EMA will reveal environmental costs and benefits. Based on a survey of 34 companies with 72 respondents knowledgeable about EMA applications and implementation. 92 percent of respondents believed, the implementation of EMA will help in revealing environmental costs and benefits while eight percent of respondents did not think the implementation of EMA will reveal environmental costs and benefits. The opinions shared by 92 percent of respondents agrees with literature which states that Environmental Management Accounting will help companies in general to realise environmental costs and benefits and make decisions which can effectively address them (Burritt & Schaltegger, 2010; IFAC, 2005; United Nations, 2001a). The opinions are represented in a pie chart in Figure 5.9 below.

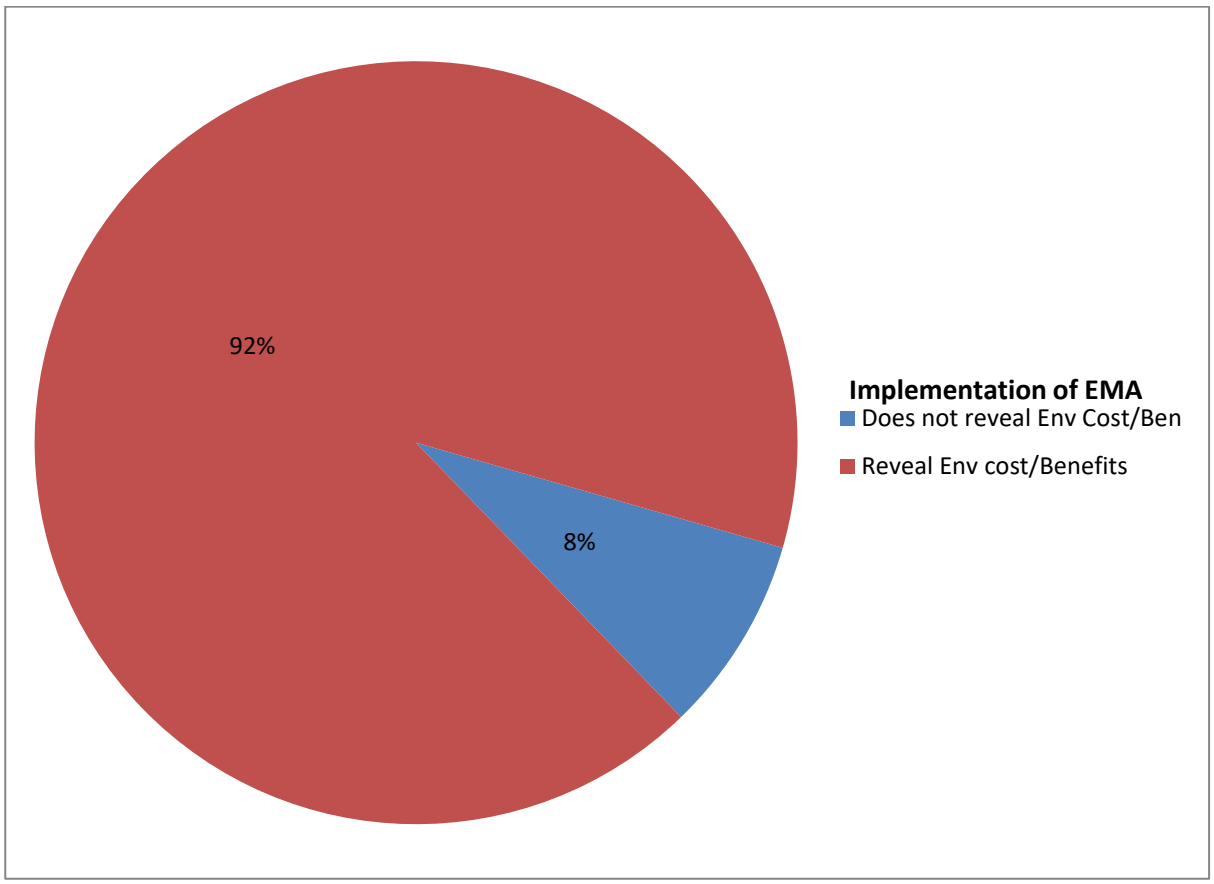

Figure 5.9 Implementation of EMA[6]

Source: Author

The researcher went on to seek to understand the environmental cost/liabilities and environmental benefits/incomes or revenues which the companies were exposed to. This helps to understand the type of costs and benefits the mining companies are exposed to. This has also been verified in the financial reports and sustainability reports. The costs were presented based on the frequency with which they appeared in the questionnaires and sustainability reports (groundedness) to fully understand the frequent environment costs and liabilities in the extractive industry. Figure 5.10 below shows the major cost categories which came out as the major themes.

[6] Refer to Appendix A: Questionnaire Section B Q4

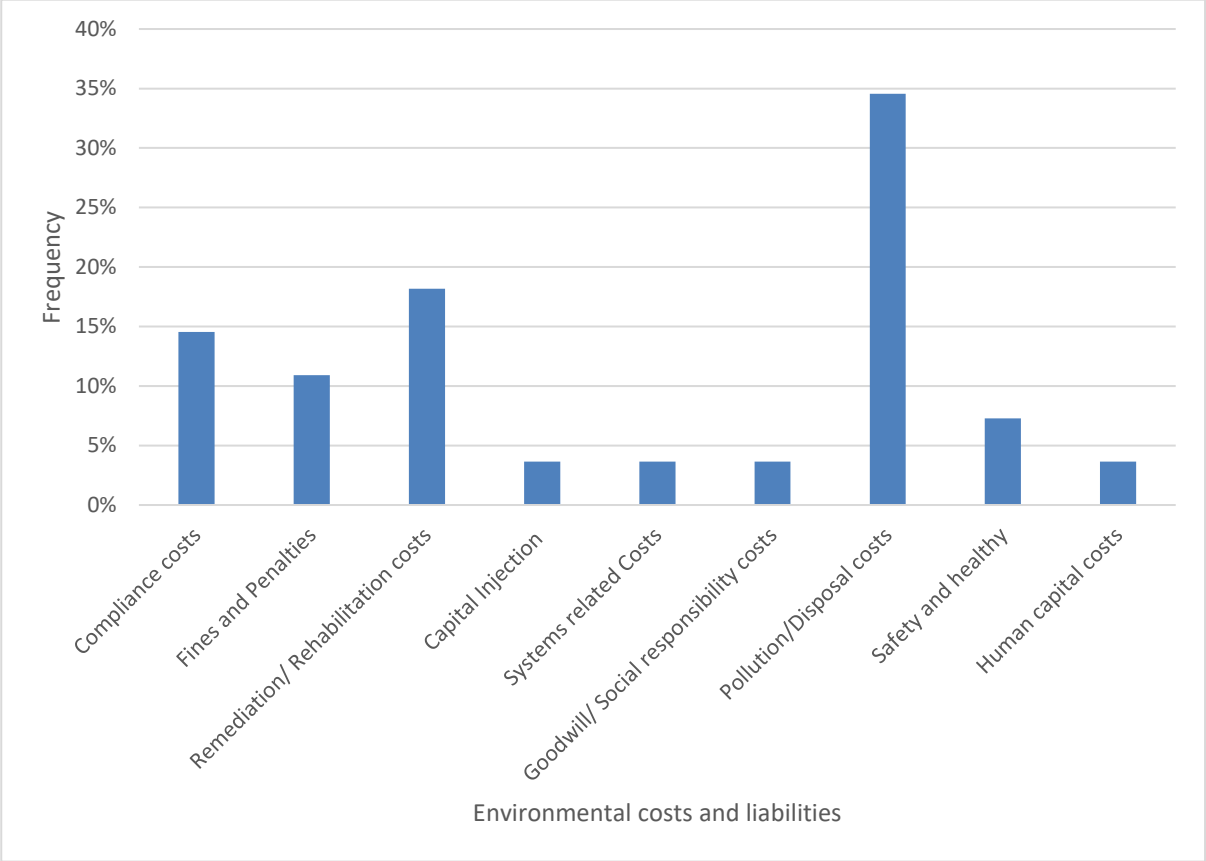

Figure 5.10 Environmental costs and liabilities in the mining sector[7]

Source: Author

The major environmental cost and liabilities categories were grouped into nine themes which are indicated in Figure 5.10 above. The most prominent costs and liabilities were listed under the *Pollution/ Disposal costs* category with a frequency of 35 percent. It was clear that most companies deal with costs related to disposal of affluent waste as well as pollution costs. The pollution and disposal costs range from, water pollution in the form of affluent waste, air pollution in the form of smoke gas emission, raw materials affluent waste, acid mine water caused by gullies (example of Mashaba mine), chemical leaks, noise and dust suppression costs to the disposal costs of related chemicals (or hazardous waste) which have a potential for affecting communities. The adverse effects of these costs are the destruction of the general biodiversity. Acid neutralisation cost is a major part of costs related to this theme.

Rehabilitation and remediation costs is another category which includes costs related to restoring the environment to its original state before the mining activities took place. Though literature argues that it is difficult to replace the natural environment once exploited *(*Burritt *et al.,* 2002; Burritt & Schaltegger, 2010; Gray, 2010b; Lamberton, 2005). Lamberton (2005) went on to state that "any

[7] Refer to Appendix A: Questionnaire Section B Q5

damage to critical natural capital would, in theory, be valued at infinite costs because it is irreplaceable, leading to a conclusion that the activities of an organisation which damages critical natural capital are unsustainable". The remediation and rehabilitation costs related to setting up a provision for rehabilitation account or provisions for future treatment of liabilities or contingent liabilities. The actual rehabilitation of exhausted mining areas comes in the form of planting trees or refilling the gullies. This cost also includes abiding by mine closure and rehabilitation regulations. The rehabilitation costs are the most prominent in terms of the major costs which mining companies are aware of being exposed to more than any other costs. The companies start contributing towards the provision for rehabilitation in the early stages of mining and as soon as the company records its revenues. It was noted in analysing survey data that even the respondents who were not able to give other costs which the company was exposed to were able to mention the rehabilitation costs and the related provision accounts in line with the government regulations.

Following the rehabilitation costs was the heavy *compliance costs* associated with the industry. The sector is heavily regulated with many acts which in most cases are followed up by the Environmental Management Agency of Zimbabwe (EMAZ). The compliance costs relate to the use of the environment, hazardous substance use and disposal. These are all covered within different Acts like the explosives and dangerous substances Act. The environmental aspects are regulated by the Environmental Management Act. The mining companies must comply with these regulations and, in most cases, must pay a certain fee to be allowed to operate. The most prominent compliance fees which the companies are exposed to are the environmental impact assessment costs which must be done before any mining activities commence. In these assessments mining companies hire experts in impact assessment to do the job on their behalf at a certain fee. In addition to EIA fees, mining companies are exposed to environmental management licencing fees, standard compliance and certification fees, different kind of permits (land use permit, explosives handling permit, mineral claims permit) which are renewed in most cases annually, licencing and claims registration fees, consultation fees and professional fees which are paid to the Ministry of Mines and Mining Development. In addition to these costs the mining companies must pay royalties and taxes to the government.

Fines and penalties characterise the sector. Tsamenyi *et al*., (2017:284) support the idea that the mining sector is largely based on 'physical and finacial penalties'. As mentioned above the sector is heavily regulated and penalties and fines are tabulated to enforce the regulations to an extent that some fines have the potential of putting companies out of business. Penalties in most cases are because of non-compliance with different regulations in the industry. The penalties in most cases are punitive. Hence, the importance of EMA in the sector which helps companies to be more pro-active

towards these issues to avoid costs which can be avoided. The fines in most cases are a case of breach of regulations, failure to comply with affluent waste disposal regulations, and non-compliance with ISO certifications in workers' health and safety standards which are expected in the industry.

The survey also identified other costs which were not coming out very prominently but which are important to understand the likely costs and liabilities as well as areas to look at in order to harvest the cost savings. The costs are capital injection costs, systems related costs, goodwill or social responsibility costs, safety and health costs and lastly human capital costs. The capital injection costs relate to the huge amounts which need to be injected to track, trace and analyse environmental costs at the start of the projects. Closed linked to this is the related ERP systems which are required to capture the costs efficiently. Goodwill or social responsibility costs relate to all costs which make the company stand alone as a unique company which can live in harmony with the community and contribute positively to the community within which it will be operating. This has been given the theme social responsibility costs or goodwill because the public image matters the most in the sector, especially in the diamond sector in which pressure groups are involved in certifying whether diamond mining does not infringe human rights. Together, acting in utmost good faith by supporting the surrounding communities through infrastructure developments, school developments and any other socially accepted activities becomes a major cost in the sector. Safety and health costs as well as human capital cost themes are closely related. The companies invest a lot in the safety of their workers to the extent of coming up with full-fledged departments which are in most cases titled Safety Healthy and Environment departments which ensure that the work places are environmentally safe and providing for the safety of all employees. Together this department caters for the medical expenses of the mining workers. This is a huge costs area in the mining sector in general which cannot be avoided or be ignored as it is part of environmental related costs of mining activities. Human capital costs are related to direct costs of environmental experts who are employed in the mining sector. These experts work together with accountants to identify and report on environment related costs in the company. The experts in this field tend to require big packs as they deem their work the background of all revenue generating activities in the company, and without them it is difficult to work in a heavily regulated mining industry.

Closely linked to the environmental costs and liabilities which mining companies are most likely to be exposed to, the researcher was interested in finding out the environmental impact of mining companies' operations which are listed in Figure 5.11 below. The environmental impacts were analysed and listed in themes as they develop throughout the survey. The study came up with six themes which are shown below and will be explained in the next sections.

Environmental damage is an inherent cost of operating in the mining industries and extractive sector. This impact had a high frequency rate of 21 in comparison with the other impact themes given in Figure 5.11 below. Environmental damage points to an activity or activities which are harmful to the environment. The sub-themes below this theme are acid rain water, land degradation, harmful gullies, creation of ghost towns, resources depletion, deforestation, major pollution, general ecological disturbances, waste rock dumps and caving in, among other environmental damage indicators as given in this survey. Mining is heavily unsustainable in nature and resources depletion is one effect that can never be replaced though it has a commensuration reward of making profits which is the reason why companies get in business. The profit-making reward vs resource extraction is considered sustainable in some sectors and literature has revealed that the only way mining activities are considered sustainable is due to their ability to contribute positively to the GDP and the fiscus of the country in a positive way.

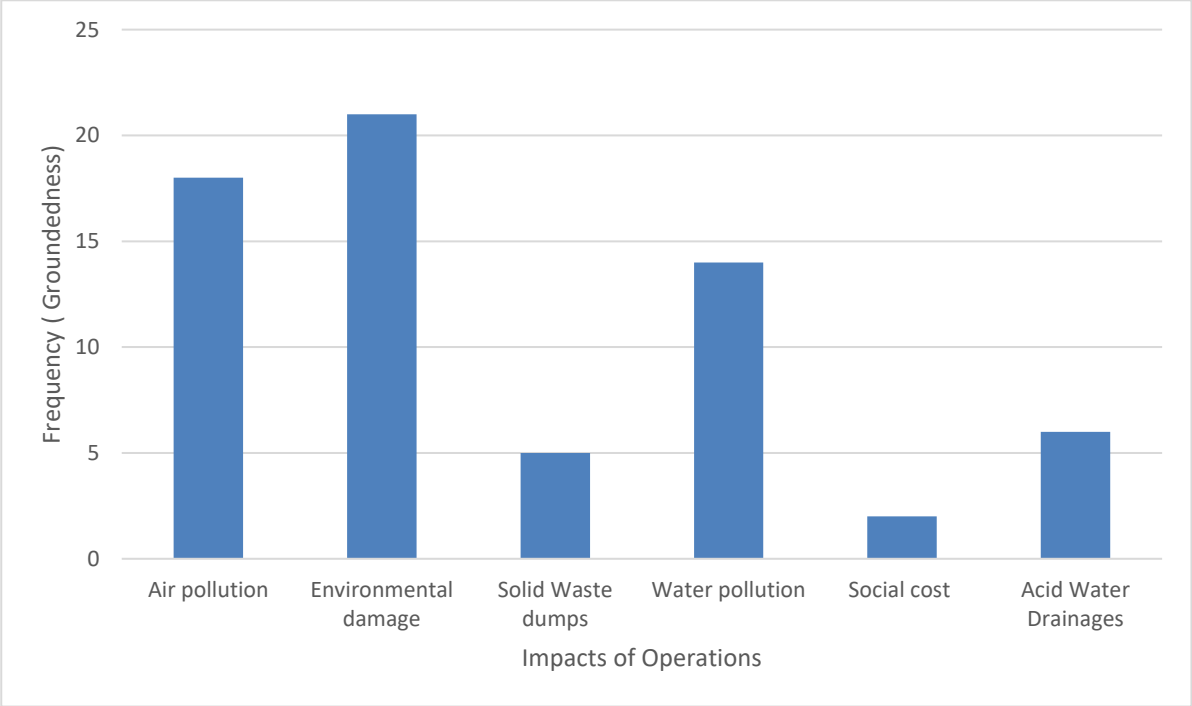

Figure 5.11 Environmental impacts of operations[8]

Source: Author

Pollution has been cited as an environmental impact of operations. This has been divided into two themes, air pollution and water pollution, because of the magnitude of the frequency of the impact in the survey. Air pollution has a high frequency rate followed by water pollution. It is clear, that most operations in the extractive industry and mining sector contribute to air pollution through toxic gas

[8] Refer to Appendix A: Questionnaire Section B Q7

emission to the environment. It's not only toxic gases which are recorded as part of air pollution but also dust pollution and noise pollution. The dust pollution is being mitigated by dust suppressors while air pollution is mitigated by the "polluter pay principle" in which a company will pay a compliance fee which is commensurate with the volume of pollution per annum. This is not sustainable because there is nothing that is being done to ensure that the harmful nature of air pollution through smoke which contains toxic gases is reduced. A follow up was made through interviews and it was noted that though these companies pay for the toxic gases which are reduced, there is not actual measurement of the volumes being released to the atmosphere by the companies themselves and there is no clear evidence of air pollution mitigating measures. Water pollution comes in different forms, among them pollution from company burst pipes, acid drainage pollution, water contamination from leaking chemicals, discharge of new affluent discharges, oil spills, liquid affluent and so many other water pollutants.

Closely aligned to water pollution is solid waste dumps and acid water drainages. These are also part of water pollution but the researcher felt the need to put them as separate themes because of the frequency in which they were appearing. Acid water drainages have been witnessed and discussed in this section. All companies which are involved in underground and surface mining face this impact during and/or after the mining activities are done. This is a major impact which also causes water pollution downstream and healthy problems at large to the communities.

This gives rise to the least impact which is significant, the social cost impact. The national social costs are either increased or decreased because of a mining company's operations. The social costs are those costs which the companies cause but do not have direct control over. These costs may include health hazards caused by chemicals which were released in rivers over time. Social disturbances are also caused by mining activities in which one area will be over populated because of job creation caused by mining activities. The social impact of mining has positives and negatives.

The environmental impacts of operations which were given were mainly on the negative side, but these can either be negative or positive. Out of the negative impacts some mining companies were utilising these to be positive impacts in the form of environmental consciousness. Some of the positives which emerged out of the positives were given as follows: in some companies where dust is a major negative impact it was being reduced by dust suppression systems. The dust suppression systems are not 100 percent effective but they help in solving the dust problem. Water contamination was completely avoided in some areas by using state of the art technology which does not require huge amounts of chemicals to process the minerals or the processing was done in areas where dumping was heavily controlled. Solid waste dumps were being rehabilitated into green land forms

on mine closure and even before the closure to create a healthy habitat for human beings and animals. Ground vibrations from blasting which had a potential long term effect of cracking of surrounding structures were reduced by use of blasting suppression machines or done in areas where community structures are far from the mining sites. In other areas remnant open pits left after mineral extraction were used as water reserves. These were investigated thoroughly for chemical components and if cleared as safe were then used as water reservoirs. The positive impacts of operations give an indication as to the environmental benefits which can be gained through proper environment management. The next subsections will discuss environmental benefits, importance of social and environmental accounting and environmental accounting ratings, followed by the perceptions on the significance of EMA.

5.4.1. Environmental benefits

Looking after the environment prudently has its advantages leading to numerous environmental benefits, like income or gain obtained because of being environmentally conscious. Environmental benefits may come in the form of environment related decisions which increases environment performance this can be equated to environmental benefits. Nine categories of environmental benefits were uncovered in this survey. The nine categories are compliance cost savings, insurance cost savings, resource conservation, health ecosystem, environmental savings, hidden costs, policy development, revenue and goodwill gains. These will be explained in the following paragraphs. The environmental benefits were developed into themes for easy analysis and are listed in figure 5.12 below.

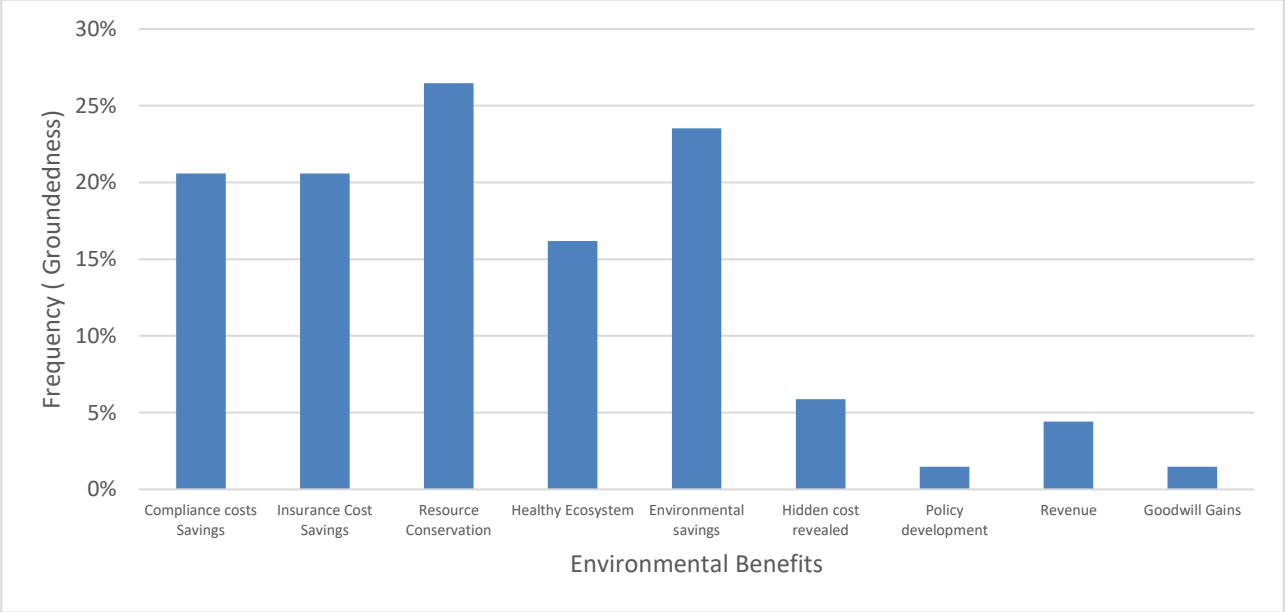

Figure 5.12 Environmental benefits[9]

Source: Author

The major benefits/incomes/gains by companies for being environmentally conscious are in the form of environmental savings, resource conservation, insurance cost savings, compliance cost savings, healthy ecosystem, hidden costs identification, increased revenue benefits, goodwill gains and environmental policy development. Environmental savings and benefits have been separated to avoid duplication of the overall benefits discussed in this section. The savings refer to areas in which the company was supposed to incur expenses but end up not incurring costs or spending less than the required. This saving usually accrues due to complying with environmental laws and regulations or intentionally avoiding damage to the environment which can have a future cost in place for a better alternative. This can better be expressed as possible environmental costs against the actual environmental expenditure. The difference will be the environmental savings. A negative difference will become an environmental deficit.

Environmental savings have been formulated from the following indications: greater rebates; huge revenue streams; reduction in medical bills; access to green markets which are more profitable; gum pole harvesting from acid mine drainages; revenue from permits for grazing cattle in rehabilitated areas; minimised rehabilitation costs; removal of water weeds; waste rock revenue through construction; reduced litigation costs; reduced economic burden of rehabilitation; and operations systems improvement. Environmental savings were indicated as one of the benefits of EMA but not peculiar only to Environmental Management Accounting. There are other ways which can help achieve environmental savings, but the availability of this tool makes environmental savings to be

[9] Refer to Appendix A: Questionnaire Section B Q 6

revealed and exploited in the best possible ways. There are rebates which accrue to companies as they act in good faith as far as environmental management is concerned. These rebates are not only available in Zimbabwe but internationally. These rebate incentives contribute towards environmental savings when you calculate the actual amount that will be paid against the actual after considering the environmental interventions employed by different companies. Huge revenue streams have been observed in other companies and countries which are brought up by EMA applications which has been indicated against the expenditures. EMA opens avenues for more revenue. Some of the revenues are in the form of reduced medical bills and the ability to tap into profitable green markets. It can be argued that reduced medical bills are not revenues, but the savings made on the healthy side of workers or the community at large contribute to the overall earnings of the company and does not deplete the revenue base of the company. There has been a noticeable reduction in the economic burden of rehabilitating mining areas, and these rehabilitated areas are providing significant revenues and savings to the communities and the companies. Some rehabilitated areas were turned into grazing lands for cattle, some were used to create green parts while gum poles were planted in other areas.

The major environmental benefit is resource conservation. This is a priceless benefit; the whole idea behind Environmental Management Accounting is resource conservation other than other benefits it brings along side. Once people are environmentally conscious, conservation is an inherent benefit. This has been cited as people become more careful of the harmful effects of their activities and in return save the planet for the future generations and to their own advantage. Resource conservation encompasses minerals conservation, prevention of pollution, monitoring and preservation of natural resources, general environmental preservation efforts, efficient use of resources, reduction of waste rocks used in rehabilitation programmes or construction, new environmentally friendly innovations, promotion of cleaner production, sustainable mining and utilisation of resources and improved waste products management.

Compliance cost savings have been put forward as a major environmental benefit together with insurance savings. Compliance costs are significantly reduced when companies are environmentally conscious. This helps also in reducing insurance costs. The insurance burden becomes light as companies prove that they are not a high-risk venture, especially the adoption of zero tolerance to accident helped many companies to pay low insurance costs because the likelihood of an insured risk taking place will be reduced. Many companies pay healthy compliance costs and fines but this can be reduced through being environmentally conscious.

Environmental costs tend to be hidden in other overheads, hence the environmental benefit of EMA is to help uncover all hidden environmental cost. This theme did not come out very much but its

availability helps understand EMA because literature has revealed the environmental costs are not known because they are in most cases hidden in overheads (Qian *et al*., 2015) and this gives rise to costing problems, where as other processes will be allocated with costs they did not incur because a blanket apportionment is applied in all processes. EMA ensures that the products and processes are costed correctly (United Nations, 2001a). This also ensures that policies which are consistent with the environmental savings are formulated and implemented there by creating goodwill for the company at large. Goodwill is one of the environmental benefits of EMA indicated in the survey. The goodwill is formulated through working with and within the community. The public image as explained in the previous sections is important for the going concern of the company. Mining companies should be seen to be operating within the confines of the belief systems of the communities they operate in. The goodwill is often classified under the intangible benefits of Environmental Management Accounting, which is an important success measure of sustainability in EMA implementation (Burritt & Schaltegger, 2010; Qian *et al.*, 2015).

5.4.2. Importance of social and environmental accounting (SEA)

The importance of social and environmental accounting has been widely accepted in the literature (Beattie, 2014; de Beer & Friend, 2006; Dobbs & Staden, 1999; Gray, 2010, 2010b, 2013; Hossa*in et al.*, 2016; Mathews, 1997) and this research affirms the importance of the three-decade long phenomenon of environmental accounting reporting. More than 90 percent of the people indicated that SEA is very important in the mining sector, while four percent indicated that it is not important. The participants indicated that the potential environmental impacts and benefits are timeously noted and acted upon due to the availability of SEA accounting systems. It has also been widely accepted that the benefits of SEA are harnessed and correctly attributed to their functional areas. This was difficult to understand and the researcher followed up on this issue through interviews to understand how the potential benefits are harnessed or realised and attributed to functional areas. The respondents were of the opinion that the benefits need not only to be realised but to be acted upon, thereby distributing them to the departments. Acting upon environmental benefits means deriving sound decisions out of the potential benefits which make a positive contribution towards the way business will be run on a day-to-day. Potential benefits have a positive impact on the revenue and profitability capacity of the company. The benefits come directly from accounting for environmental impacts.

Social and environmental accounting, which is the same as Environmental Management Accounting, has been seen to contribute in accurately measuring the incomes and expenditures directly attributed to the management of the environment. This has not been possible in the past since costs were being indicated in the overheads of the company. Specific departments in the company can accurately be

attributed with the costs of their operations and corrective measures can be taken to reduce them or to contain them to an acceptable level. At the same time, SEA addresses resource conservation issues within its framework. SEA is not only concerned with the production of monetary accounting (MEMA) figures but also with the production of physical information (PEMA) which helps in identifying potential costs/revenues and interprets them in monetary terms. Hence, the call for professionals from different fields to work together to identify such costs. The resource conservation aspects in SEA also point to the issues of sustainability in Environmental Management Accounting. This is because SEA addresses both the social pillar of sustainability and the environmental pillar of sustainability with the economic pillar being embedded in the accounting aspect of the subject. It has been indicated that SEA is the only sustainability hope which the future generations can hold onto; without it there is no way companies can be held responsible without the trade-off needed with making profits (Bebbington & Gray, 2001; Bebbington, 2014). Value can be placed on the environment and the natural resources due to SEA and the issues to do with sustainable utilisation.

Downstream effects of SEA have been mentioned as an impotent aspect of this phenomenon under investigation. This means that the benefits can never be predicted in most cases if the companies act in good faith. There is so much potential to be tapped out of SEA but some of the benefits or effects can never be known in the short-term but only in the long term. This is an investment (environmental capital investment) which companies should not do trying to make money out of it but building a legacy for the future generations. The implementation should come from the willingness of the companies to work in utmost good faith and in harmony with the communities the companies will be living in. Hence, the respondents indicated the downstream effects as an important nature of SEA. The possibilities of its importance can never be exhausted once it comes from the willingness of the companies to contribute positively to the environment. The companies also become conscious of their activities and how they directly deplete their revenue and how they affect the environment. An accountability system makes companies to be more conscious rather than when it is not available. The organisational processes impacts are made known and organisations can be accountable for their activities through this accountability system of recording environment related costs and revenues.

The social aspect of environmental accounting taps into the wellness programmes of employees and ensures that their social environment is protected and looked after. This ensures that workers are always available for work and the absenteeism rates are reduced, and staff turnover is kept at the minimum levels. The wellness programmes are funded because of the direct effect they have on the companies' outputs. The wellness programmes are not only for profit reasons but the general health of workers and communities around the mining activities.

Mine costing becomes apparent with the availability of SEA. This means SEA helps in spreading the cost of mine closure over the life of the mine thus avoiding huge amounts of money at the end which almost makes rehabilitation of the mines impossible, not only rehabilitation but also in carrying out of other projects in cases where a company has more than one mining claim. The mine costing system contributes directly towards mitigation measures of environmental degradation and other related environmental impacts. The SEA system makes these mitigating measures apparent and can be thought of in detail before the mine closures or even way before the potential harmful effects occur. In essence SEA helps in implementing activity-based costing which improves internal company cost calculations by allocating costs typically found on overheads costs to the polluting activities and products (United Nations, 2001b). The system allows the internalisation of many environmental costs given the shortcomings of traditional accounting (Deegan, 2013)

The most outstanding importance of SEA is its contribution towards organisation decision making processes, helping management to make informed decisions which ultimately give them many benefits, among them, financial savings due to reduced environmental costs and an understanding of physical flows of raw materials and processes of production which help in coming up with environmentally-related information. The SEA information contributes to or helps in reducing environmental breaches thereby improving interface with other stakeholders who are interested in environmental accounting as well as pressure groups. This ensure that human rights to the environment are not infringed by the wealthy multinationals who believe that they can pay themselves out of any situation which is not humanly acceptable. The decision-making process arm which SEA brings ensures that environmental performance is tracked and corrective actions taken immediately (Jam*il et al.*, 2015).

Social and environmental accounting is a subtle government requirement to abide by in the mining sector, hence the inclusion of environmental protection legislation and the requirement for environmental impact assessments. This requirement will give the government a policy direction or starting point in ensuring that, other than having environmental compliance requirements, systems can be put in place that act as checks and balances in sustainable environmental utilisation. The systems will be subject to audits which enhance the EIAs (Owen *et al*, 2000). Other respondents indicated the importance of SEA as a government requirement coming from the view that the government emphasises a lot of accountability which is socially acceptable and at the same time which is environmentally acceptable. The environmental agency of Zimbabwe (EMAZ) is responsible for enforcing these legislations and requirements all over the sectors of the government. The availability of the system overall gives a sense of responsibility which they must protect and report on to all the stakeholders within the mining fraternity and even out of the fraternity.

The Figure 5.13 below shows the respondents who indicated that SEA is very important and the underlying reasons. 96 percent indicated that SEA is important and gave the reasons articulated in themes explained in the sections above, while four percent of the respondents indicated that SEA was not important. All the respondents did not give the reasons or explain why they say it is not important. The major contributing reason might be the lack of knowledge of the subject matter and lack of engagement with either the positive side or the negative side. The best possible answer in such circumstances will be to indicate that SEA is not important.

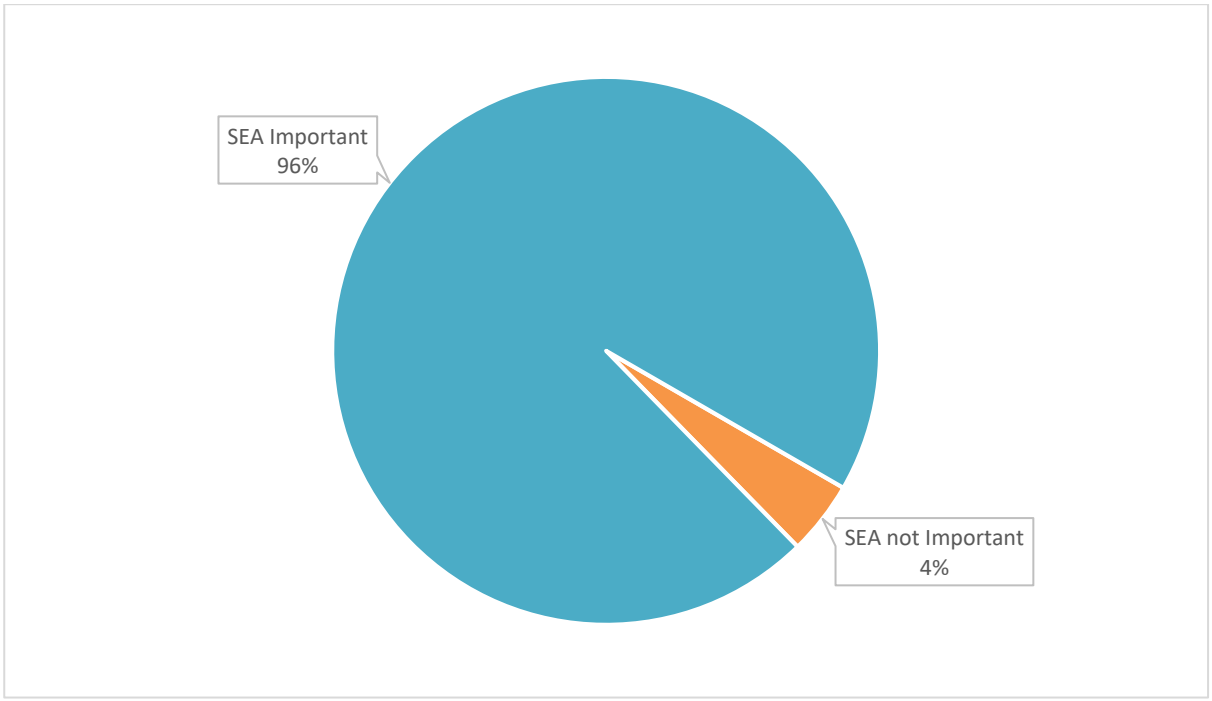

Figure 5.13 Importance of social and environmental accounting[10]

Source: Author

5.4.3. Environmental accounting improvement ratings

The study sought to understand the opinions of respondents on the improvements brought by EMA which is environmentally aligned and the improvements brought by accounting for the environmental impacts in monetary and physical terms in companies which have high environmental impacts. As indicated in the literature (See section 2.1.8), the developing countries are slowly adopting EMA (Lodhia & Hess, 2014). Most of the respondents' ratings relate to the slow adoption of EMA. The ratings have been placed on average (46 percent) which indicate that the improvements being brought by EMA are not very significant. 25 percent of the respondents believe that the improvements brought by EMA are either good or very good. Four percent of the people also indicated that the improvements

[10] Refer to Appendix A: Questionnaire Section B Q8

have an adverse effect. The four percent of respondents are believed to be the same people who indicated that SEA is not important due to lack of knowledge of the area. Follow up interviews have been done to establish why the four percent indicated that the improvement rating of EMA is bad and it was discovered that the respondents did know exactly why because there was no commensurate explanation of why they thought the improvements were bad, except for the idea that EMA is expensive and requires huge capital investments to implement it. It is important to also note that 50 percent of respondents are on the good side of the ratings which is a good indication of the improvements which can be brought by EMA applications. Figure 5.14 below represent the environmental accounting improvement ratings.

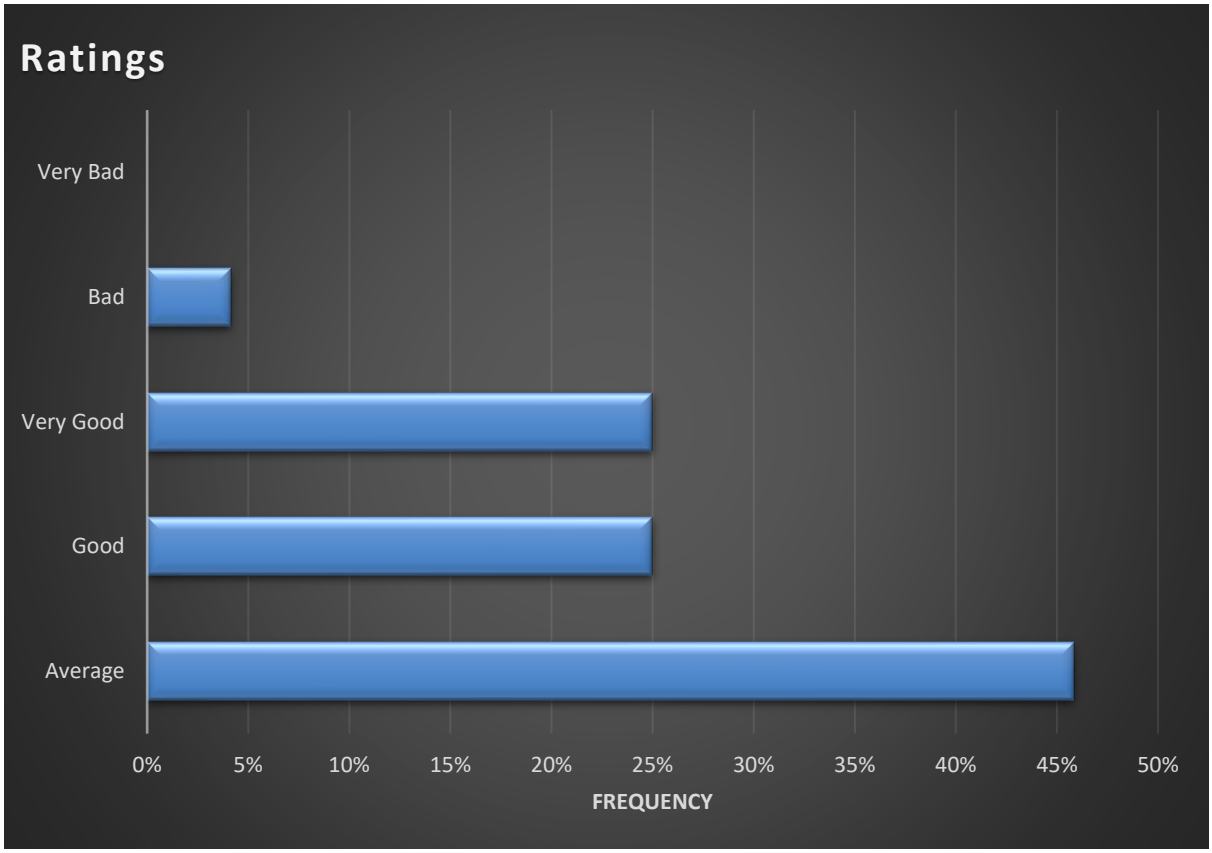

Figure 5.14 Environmental accounting improvement ratings[11]

Source: Author

5.5. Perceptions on the Significance of EMA

Industry at large has different opinions and perceptions about the significance of EMA which has been over-emphasised in literature. The study sought to understand the significance of EMA from the side of the practitioners themselves in the extractive industries. Getting an understanding of the

[11] Refer to Appendix A: Questionnaire Section B Q9

significance of EMA from the practitioner's point of view helps in appropriately placing the EMA priorities or issues it addresses. To understand the perceptions on the significance of EMA the researcher was interested in finding out if the different practitioners in the mining sector understand Environmental Management Accounting in relation to their industry. Opinions can only be placed in an area which is understood by the participant. The researcher also sought to understand if they refer to accounting for environmental issues differently from the norm established by the academics in EMA, and whether the companies have already implemented the practice. The research also sought to understand the financial implications for damaging the environment and for not using EMA systems. Lastly, the study sought to understand if there is need for companies to have a new accounting system which caters for environmentally related activities which are completely divorced from the traditional accounting systems already in existence. This in turn helped in coming up with a model framework for EMA in Zimbabwe extractive industries. The following subsections will discuss the issues in detail, focusing on EMA knowledge and terminologies in Zimbabwe, implementation of EMA, financial implications of EMA and EMA systems vs traditional accounting systems.

5.5.1. EMA knowledge and terminologies in Zimbabwe

EMA knowledge is obscured in many developed countries to the extent that companies and individuals use different terminology to refer to the accounting of environmental related costs and benefit as was explained in section 2.2.1 of Chapter 2. A survey was done to determine the knowledge and terminologies used to refer to EMA specifically in the Zimbabwean mining sector and extractive industries. The results from the survey are summarised in Figure 5.15 below.

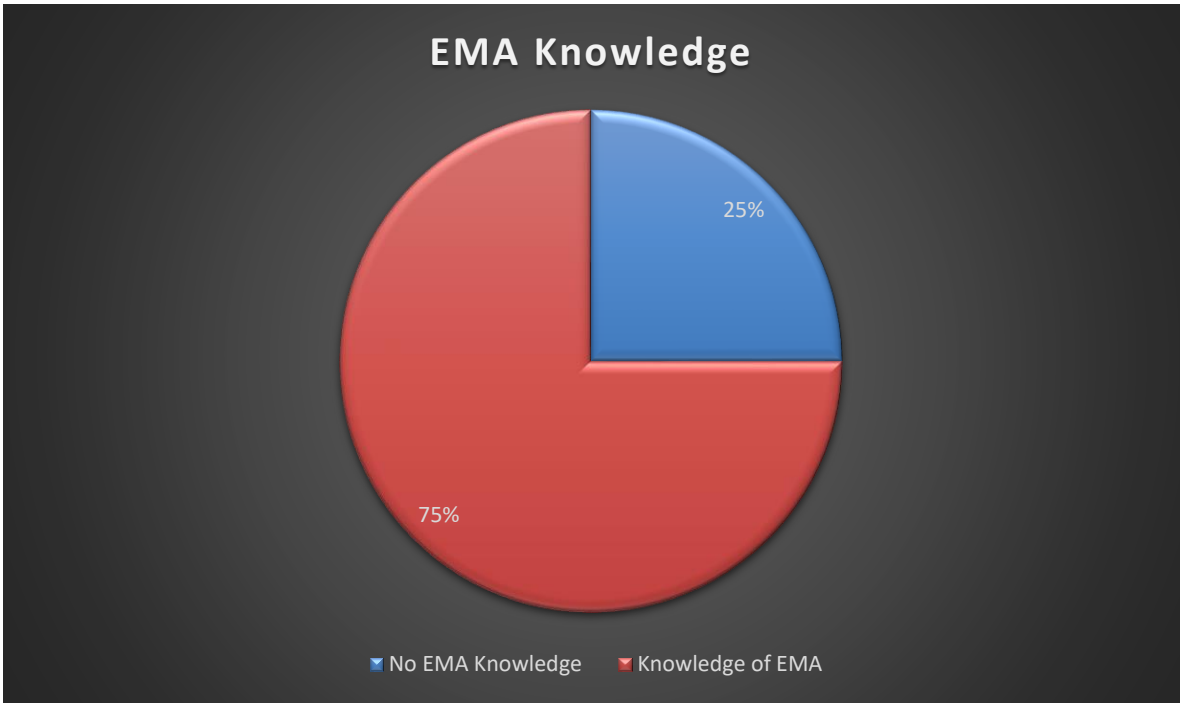

Figure 5.15 EMA knowledge in the mining sector[12]

Source: Author

It is clear from Figure 5.15 above that about 75 percent of the respondents have knowledge of EMA in all the companies which were surveyed. 25 percent do not have knowledge of EMA. This is, however, supported by different terms which are used to explain EMA in the mining sector and extractive industry of Zimbabwe. The above data are contrary to extant literature which suggests that not many people are aware of the existence of Environmental Management Accounting (IFAC, 2005; Islam & Deegan, 2008; Qian *et al*., 2015); however, it can be argued that the sector which is under investigation has numerous environmental impacts (Murombo, 2013) which make the people in the industry aware of EMA, but taken on a national level it might be true that only a few people are aware of EMA as a subject. The researcher will not look at the knowledge of the subject at national level due to the limited scope of this research which focuses on the mining sector and extractive industries of Zimbabwe. The above results on figure 5.15 will further help to understand what exactly the respondents refer to as knowledge of EMA. This will include different definitions and terminologies which will be summarised in Figure 5.16 and Figure 5.17 respectively. The research sought to understand the meaning of this term (EMA) to the respondents in the sector to determine if the researcher and the respondents were on the same level of understanding of the phenomenon under study and not to assume that this was so, while at the same time trying to see how the definitions or explanations or terms which were used are closely linked to the literature reviewed. There is

[12] Refer to Appendix A: Questionnaire Section C Q1

piecemeal or fragmentary understanding of EMA concepts which, when put together, make up a solid definition of EMA. All the components of the terms were clearly articulated. The respondents who indicated that they had/ they do not have EMA knowledge were probed further to give their opinions on what they think EMA might be. Some respondents gave their opinions and some did not give their opinions on what they think EMA might be. The responses were tabulated into themes which emerged with the frequency of appearance (groundedness).

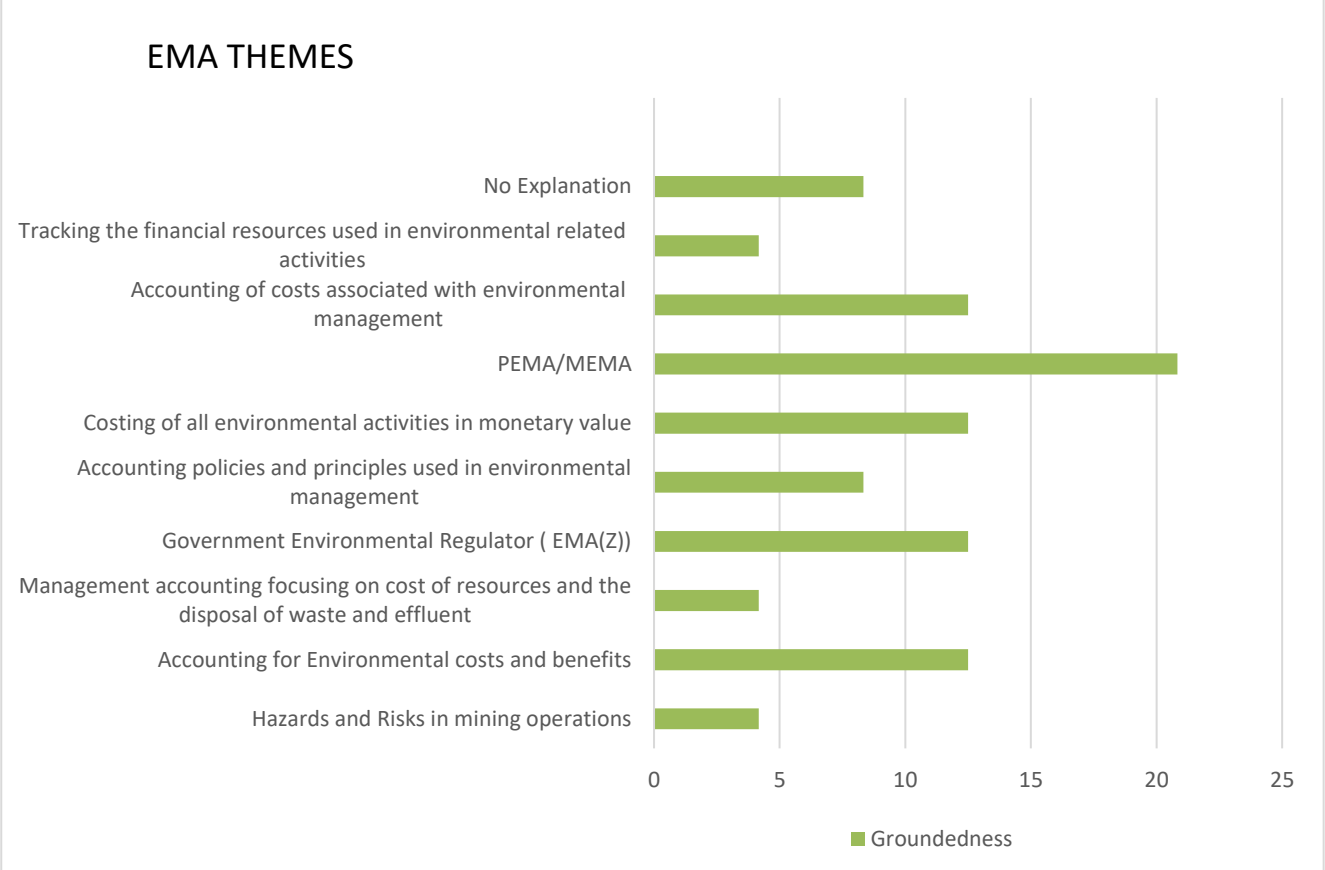

Figure 5.16 Themes defining/explaining EMA[13]

Source: Author

Twenty one percent of respondents indicated that EMA comprise of Physical Environmental Management Accounting (PEMA) as well as Monetary Environmental Management Accounting (MEMA) as indicated in Figure 5.16 above. EMA was explained as *"the identification, measurement and estimation of physical materials and monetary flows related to environmental management and the associated accounting and reporting" (P67:28).*

[13] Refer to Appendix A: Questionnaire Section C Q1 part b

"*It is the identification, collection, estimation, analysis, internal reporting and use of physical flows and environmental costs (and other monetary cost) information for management decision making within an organisation "(P80:30).*

"Identification, collection, analysis and use of materials and environmental cost information for both conventional and environmental decision making within an organisation" (P91:19).

The direct quotation above extracted from "Atlas.ti" indicates that the knowledge of EMA comprises of the physical flow of environmental information as well as accounting for it in monetary terms. EMA has also been explained as the ability to account for environmental costs and benefits associated with environmental management. There is an indicated wide misunderstanding of the EMA term which has been taken to be synonymous with the government environmental regulator in Zimbabwe-Environmental Management Agency of Zimbabwe (EMA(Z)). The respondents indicated a 13 percent understanding of EMA as being related to the regulator rather than the practice. The board ensures that environmental laws are enforced throughout Zimbabwe.

Most of the respondents indicated EMA as part of management accounting which focuses on costing resources and the management of waste disposal and affluent; furthermore, EMA comprises of accounting policies and principles used in environmental management including the tracking and tracing the financial resources used in environmentally related activities. This is done to ensure that informed decisions are made on the impact of the company's activities on environmental performance and financial performance of the company. The concept has been defined as *"a system by which organisations evaluate in monetary terms the cost of maintaining the environment they are operating from"*. The definitions of EMA displayed by respondents indicate how diverse and wide spread the understanding of this idea is. This has been further buttressed by the different terms which were given by participants to indicate what they refer to as EMA in their companies. The information is summarised in Figure 5.17 below.

The major term used in the mining sector to refer to EMA is 'rehabilitation and mine closure costs' (29 percent). When companies are accounting for environmental impacts in the sector it will be under the rehabilitation and mine closure costs, which in most instances will be a lump sum payment every year towards this account which is heavily monitored by the government through environment regulators. The other term mostly used is environmental management programs (EMPs), representing 21 percent of the respondents. These are all programmes which aim at ensuring that programmes which reduce environmental impacts are implemented. These include environmental awareness programmes as well as the rehabilitation of gullies created by mining operations. Some companies use terms such as environmental sustainability accounting, environmental accounting costing, EMA,

as well as safety environmental and quality control. This indicates how diverse the concept is being applied in the same sector and brings out or supports literature which posits that EMA is complex in the mining and extractive industry (IFAC, 2005; Luther, 1996; United Nations, 2001a, 2001b). There is no single understanding of the concept although companies ensure that environmental impacts are accounted for in both physical and monetary terms. Luther (1996) argues that there is lack of uniformity and latitude of acceptable accounting practices in the extractive industries. This lack of uniformity is also true in Environmental Management Accounting hence the complexities which make so many scholars and companies not willing to proceed with implementing EMA in the mining sector.

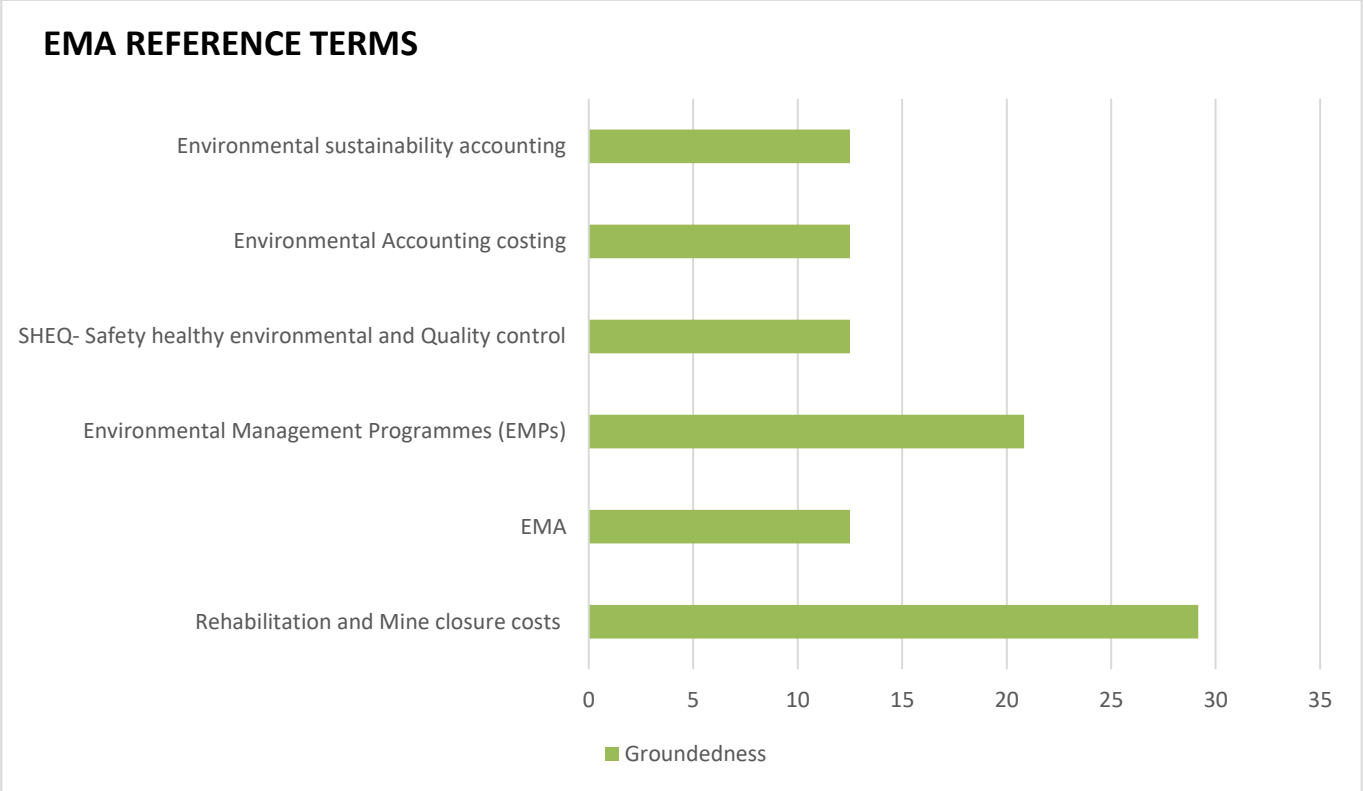

Figure 5.17 EMA reference terms[14]

Source: Author

5.5.2. Implementation of EMA by mining companies

The implementation of EMA as per the literature involves the process of determining activities which may be classified as belonging to Environmental Management Accounting (Rikhardsson *et al*, 2005). These may include simple activities like the accounting of environmental impacts in physical and

[14] Refer to Appendix A: Questionnaire Section C Q2

monetary terms or the mere recording of transactions which reflect environmental activities in themselves. These activities are accounted for in the financial statements/books of accounts or environmental managers' reports. To understand whether companies are doing Environmental Management Account the participants were asked whether they were implementing EMA using a scale of no, not sure and yes. The scale avoided the outright yes/no question type to give room for participants who might not have an idea of what is happening in their company to ensure accurate results are obtained. The results are indicated in Figure 5.18 below. Sixty-five percent of the respondents indicated that their companies are implementing EMA with diverse and different names they give to Environmental Management Accounting systems, while 35 percent of the respondents are either not sure (27 percent) or not implementing at all (eight percent). Generally, companies in the mining sector are implementing EMA with a few companies not aware of what is happening in the sector.

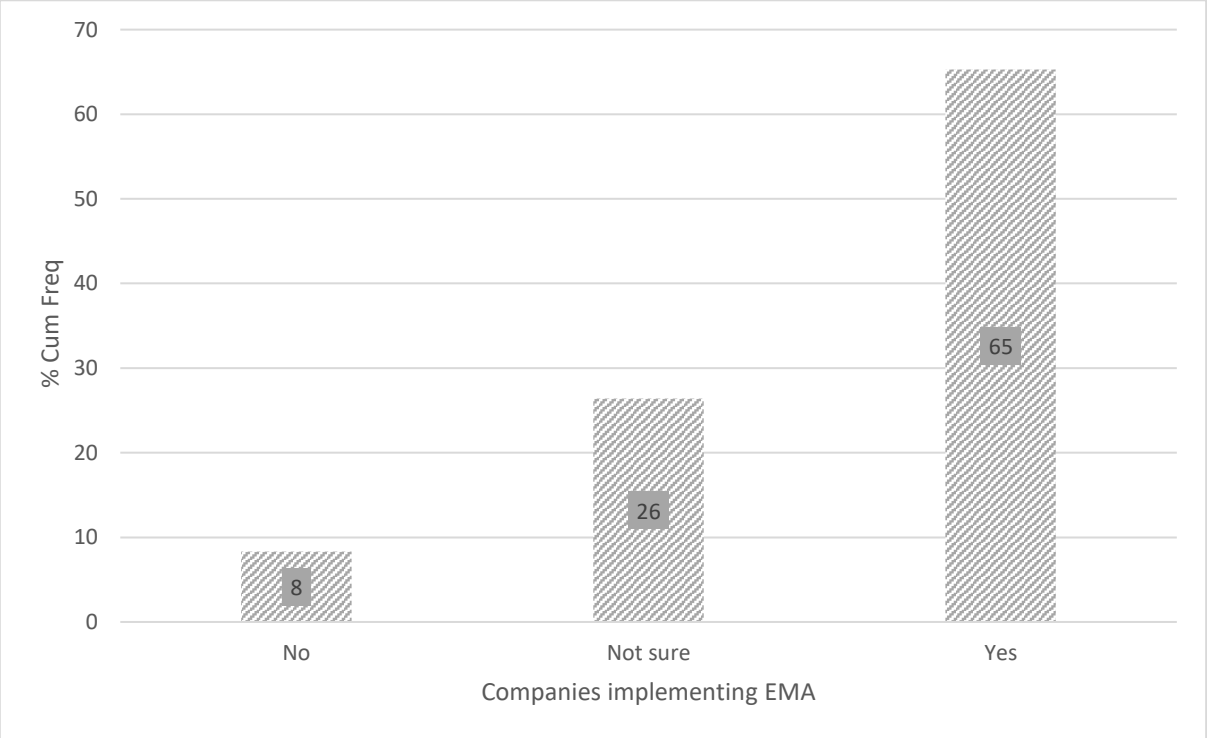

Figure 5.18 Companies implementing EMA systems[15]

Source: Author

The companies tend to benefit a lot in implementing EMA and the major benefit is the avoidance of company closures through compliance with environmental rules and regulations in the sector which has a potential to erode the revenue base of the company. This has been expressed by one responded as follows:

[15] Refer to Appendix A: Questionnaire Section C Q3

"*If the company follows the laid down rules and regulations it will avoid being closed down preventing loss of revenue" P74:29.*

In the same vein, companies are also able to spread the rehabilitation costs over the life of the mine. This essentially means costs are correctly allocated to cost centres which in turn helps companies make proper and informed environmental decisions which at the same time helps costing of end products easy and accurate (Bartolomeo *et al*., 2000). The overhead costs do not usually belong to one cost centre but different cost centres and processes, so detailed costing of these is of paramount importance to ensure that the cost of the end product carries different components from different departments or processes, and cost centres are allocated their costs appropriately. In addition, EMA systems work as an environmental management control system or checks and balances for environmental management impacts integrated in the accounting systems of the company. The checks and balances can help indicate the state of the environment at any time in monetary and physical terms, thereby improving environmental performance throughout the company. "*The process enhances the availability of accurate and comprehensive information for the measurement and reporting of environmental performance at the same time improving company image in the eyes of stakeholders" (P91:22).*

One of the benefits of EMA in mining companies is to ensure that sustainable companies grow and will help the future generations harvest the hard work of the present generations. Sustainable 'green' companies can be natured through the implementation and practice of good environmental management through EMA systems. Although literature argues that companies in the extractive industries rarely market their products through good environmental practice because their end products are in demand in the global minerals markets, environmental performance matters to different stakeholders and the potential benefits of EMA should be known to companies (Christ & Burritt, 2012; Schaltegger & Zvezdov, 2015; Sinding, 1999).

Other respondents do not see how EMA benefits the companies because they believe that the environmental certification through the International Standards Organisation (ISO) 14001 and Occupation Health and Safety Assessment Series (OHSAS) 18001 takes care of all the environmental health impact risks companies are exposed to or likely to be exposed to and once a company receives the certification then the environmental impact risks or benefits are taken care of. The ISO 14001 series focuses on the development of environmental management systems and was set up in response to a high demand for environmental management systems in businesses with moderate to high environmental impacts. ISO also established certification criteria and the assessment model on which the assessment will be based. OHSAS is intended to help organisations in controlling safety and

occupational risks in areas like the mining and extractive industries where human safety and health are under threat. It was developed due to widespread demand for standards in the industries and a baseline in which risk assessments can be done. The mining companies with such certifications in place do not see the need for Environmental Management Accounting systems because they believe the system is inherent in the assessment and certification criteria of ISO and OHSAS.

Environmental Management Accounting is not being handled as a separate accounting system which is divorced from the entire traditional accounting system and it is difficult for company managers to tell whether EMA is important apart from the traditional accounting systems. Bennett *et al* (2004b) suggest that the two systems should be distinct for correctly costing products and processes and ultimately coming up with sound decision making and the harvesting of potential environmental benefits.

The survey indicates that EMA is likely to benefit the companies in the mining sector and this is represented in the pie chart in Figure 5.19 below.

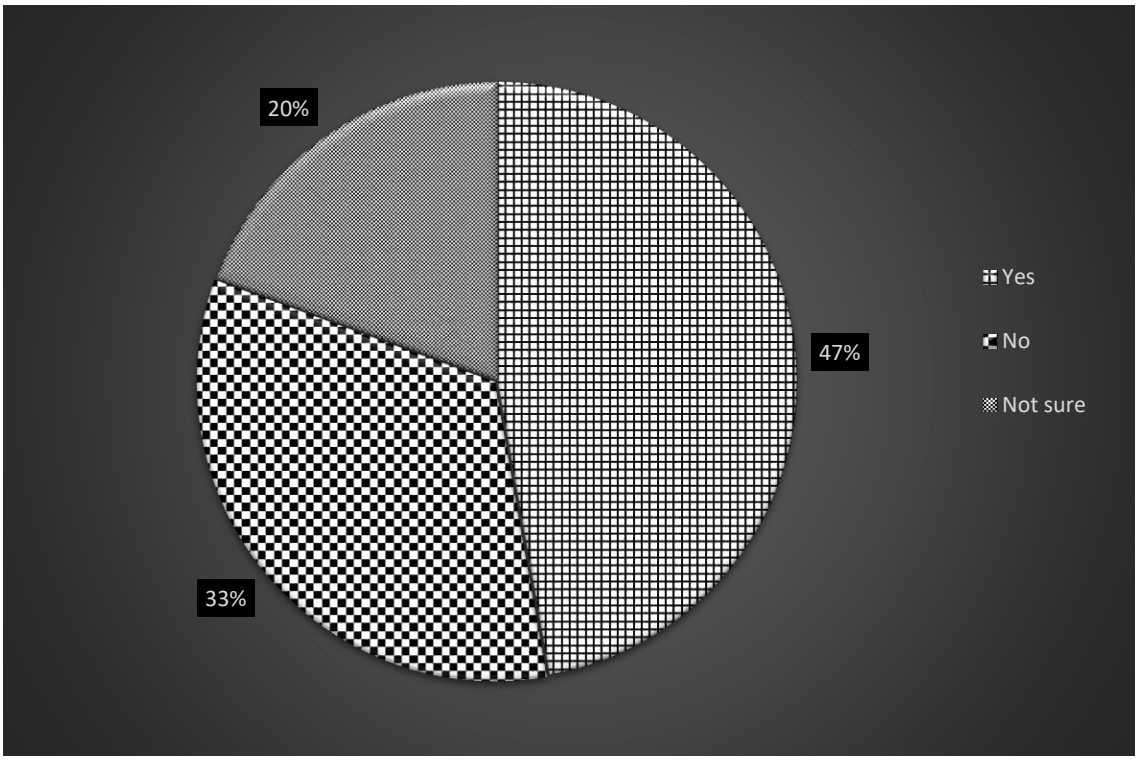

Figure 5.19 Benefits of EMA to mining companies[16]

Source: Author

[16] Refer to Appendix A: Questionnaire Section C Q3(b)

Forty-seven percent of respondents believe that EMA is likely to benefit the mining sector and extractive industry companies while 33 percent of respondents were not sure and 20 percent indicated lack of knowledge on what will happen if EMA is being implemented in terms of benefits which will accrue to the companies. The results in Figure 5.19 above shows mixed feelings on the benefits which EMA is likely to bring to the companies. 53 percent of respondents are either not sure or think that EMA will not bring any benefits, while 47 percent of the respondents are positive of the results. This might be a challenge in implementation of EMA if more that 50 percent of the respondents in the sector do not know the likely benefits to accrue due to the implementation of EMA, while slightly less than 50 percent strongly believe that EMA will benefit the company to some extent. There is evidence that there are potential benefits to be harvested after the implementation of EMA , though there is a commensurate potentially high cost of implementing EMA (United Nations, 2001a).

5.5.3. Financial implications of EMA systems

There are many financial implication for damaging the environment or for not using EMA systems which have been observed by companies implementing the systems in their companies. The financial implications for damaging the environment are numerous and pose a threat to the existence of many companies, hence the sustainability of the companies in the mining and extractive industry of Zimbabwe. The implications have been put in different themes which will be discussed in the following sections below.

Reduction of regulatory penalties has been one of the financial benefits which accrue to companies implementing EMA. The EMA systems enable companies to be aware of all environmental issues which should be taken into consideration for companies to operate optimally within the confines of the law and the communities within which they operate. The reduction of regulatory penalties help companies to have higher per-unit revenues from company operations, thereby increasing the profit margins without increasing production levels or output capacity levels. The profits will increase because the environmental regulatory penalties in the mining industry are heavy to the extent of possibly causing a company to go out of operation. Compliance costs are also very high and deter other companies from entering the industry; therefore, a saving in the reduction of compliance costs is a huge saving which can be accounted for in the company financial statements. The penalties are usually in the form of fines or cancellation of an operating licence. Revenue is lost through payment of these fines. This has best been elaborated by a respondent as follows:

"Luckily our company has a history of winning the industry awards for Safety Health and Environment (SHE), consequent to good EMA. if we were damaging the environment, the direct financial implications would be higher production costs because of people and equipment operating

in an environment full of effluent that damages the equipment, costs of higher accident rates and severity penalties, and unsustainability" (P67:35). Schaltegger & Zvezdov (2015) supports this argument and states that sustainability accounting can be considered an organisational innovation in the sense that companies end up having many alternative ways of doing business in an eco-friendly manner at the same time harnessing more value for the stakeholders and the economy at large. In addition, organisation innovation can be in the form of knowledge development in sustainability accounting.

The sector is heavily characterised by legal battles due to environmental carelessness by many companies. Legal costs are one of the huge costs which cannot be avoided if a company is not careful of EMA systems. These costs can also go to the extent of helping the regulator revoke mining licences of companies. The costs may also emanate from different stakeholders suing mining companies for environmental pollution which has an impact of causing health hazards to the communities around the mining activities or to the ecosystem which humans and animals depend on. Future unknown costs are likely to be realised long after the mining operations have ceased or when the mining companies will not be profitable. These unknown costs will need to be met by the current operations causing a heavy strain on the operations of the company. The unknown costs may be financial or non-financial. EMA systems help companies realise and anticipate the unknown costs and create the provisions or set aside money to cater for the unknown costs which can be calculated with easy if the companies have a system which caters for environmental costs and liabilities.

The notion of catering for environmental liabilities is in congruence with current literature which suggests that Environmental Management Accounting systems help companies set up contingent liabilities (and the disclosure thereof) and provisions for future treatment of liabilities (Bebbington & Gray, 2001; United Nations, 2001b). It is important to mention that the current accounting systems are not designed to handle contingent costs. They are generally avoided in financial reporting and when they appear they are subjected to strict standards for estimation and disclosure (United Nations, 2001b). The contingent liabilities represent major environmental, business and financial risks for businesses (Ambe, 2007). The unknown (or future) costs will end up increasing the government financial burden. If the costs incur after the mining operations cease, the government assumes the burden and ensure that the citizens are safe from any threats to human and animal life or to the fauna and flora. The increased financial burden encourages the government to increase the regulation of the industry with more drastic environmental policies and regulations.

Distortion of accounts and possibly understatement of costs may result because of not having EMA systems. Accounts may be distorted and understated because environmental costs will not be taken

into consideration and will be accounted for under the broad overheads of an organisation instead of being allocated to appropriate departments. EMA opens eyes to hidden costs which may give a company false figures at the end of the year. The unveiling of such costs through EMA ensures that correct environment related accounts are produced as well as the proper allocation of costs to appropriate costs centres is done. Every activity in the production process is properly conceptualised from the physical activities to the monetary activity, until values are placed on all environmentally related activities and reported at the end of the reporting period. This ensures that costs are correctly recorded and reported for decision making purposes. In line with the above, the other financial implication of not having Environmental Management Accounting systems is failure to comprehend the breath and magnitude of environmental costs to which the company and the external stakeholders are exposed. This will result in the company failing to meet its goals in the future and concentrate on unforeseen environmental costs which the company was exposed to in the past and did not care for.

Tracking and reporting of benefits and opportunities for companies is made possible through the implementation of EMA. The potential benefits of EMA have been pointed out in the previous sections.

It has been stated that financial implications are difficult to quantify in monetary terms or explain. Though they are difficult to explain, adverse financial implications, will occur if the environment is not taken care of. This is because of the complex nature of EMA systems and the potentially high costs associated with implementation of EMA to take care of environmental costs and to be able to help companies reap some benefits out of it.

There are likely possibilities of losing money through health related issues. This might not be at company level but at national level in helping individuals/communities who would have been affected by the adverse environmental effects of mining activities. The health issues might range from malaria caused by gullies left by mining companies which eventually become breeding grounds for mosquitos. In addition, exposure to different acids which are used to clean minerals can cause skin disease and the development of cancerous cell in human bodies. All these costs are dealt with at national level by the government and individuals long after the mining activities are conducted.

EMA systems enhance the attractiveness of a company trading with others in the global competitive and profitable ‘green’ markets (IFAC, 2005). Compliance with Environmental Management Accounting regulations as stipulated by the International Federation of Accountants (IFAC) allows companies to gain access to global markets which believe that green companies are the only sustainable companies. Pressure groups support this kind of business as well as the international community. This is true especially in the diamond industry in which companies should be certified

to trade their minerals with other countries or companies outside their boarders (Makore & Zano, no date; Mtisi *et al*., 2011). EMA point to all that, and enables companies to properly implement appropriate systems for good business and access to profitable markets. Some mining companies are not able to sell their products to the international markets because they lack proper green reporting mechanism which are required to be integrated in the reporting systems of the mining companies let - alone the certification with international regulators which gives access to these green markets like the Kimberly certification process in the diamond industry. Lack of EMA may also cause loss of customer base or global industry market share. There are those markets which strongly believe in the preservation of the environment and those customers may be lost to the company if it does not follow proper environment regulations which can be easily implemented through the application of EMA systems. The data pertaining to the 'groundedness' of the financial implications as given by the respondents is given on Figure 5.20 below, showing the themes which emanated from the responses as they were given.

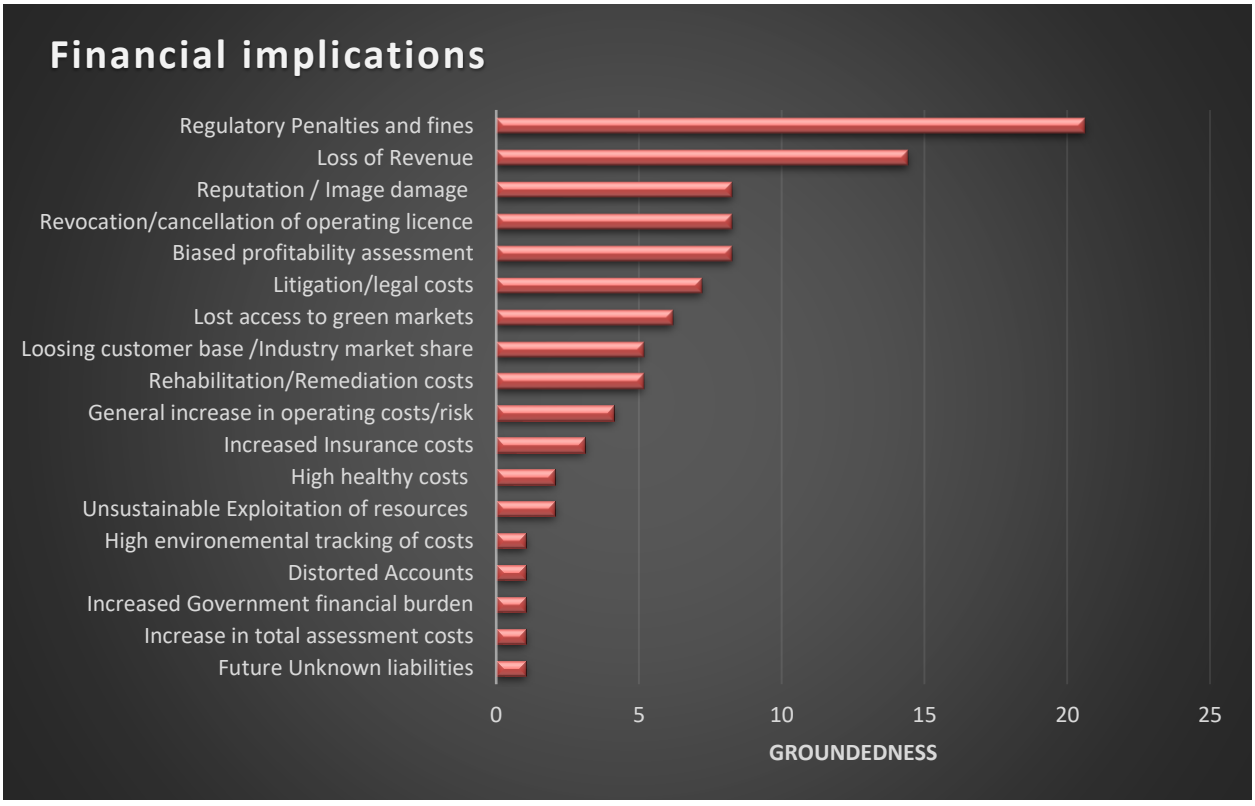

Figure 5.20 Financial implications for not having EMA systems[17]

Source: Author

The most frequent financial implication of not having EMA systems is the increase in costs of regulatory penalties and fines. This is followed by loss of revenue which will have a resultant effect

[17] Refer to Appendix A: Questionnaire Section C Q5

of reducing profits of the trading companies. There are high chances of reputational damage of companies which are not environmentally savvy and an ultimate loss of trading partners in the global green markets.

5.5.4. EMA systems vs. traditional accounting systems

The aim of this study was to understand whether the mining industry would prefer to maintain its traditional accounting system or to develop a fully integrated Environmental Management Accounting system which caters for all environment related activities of the company. The results obtained from the survey are indicated in figure 5.21 below in a pie chart.

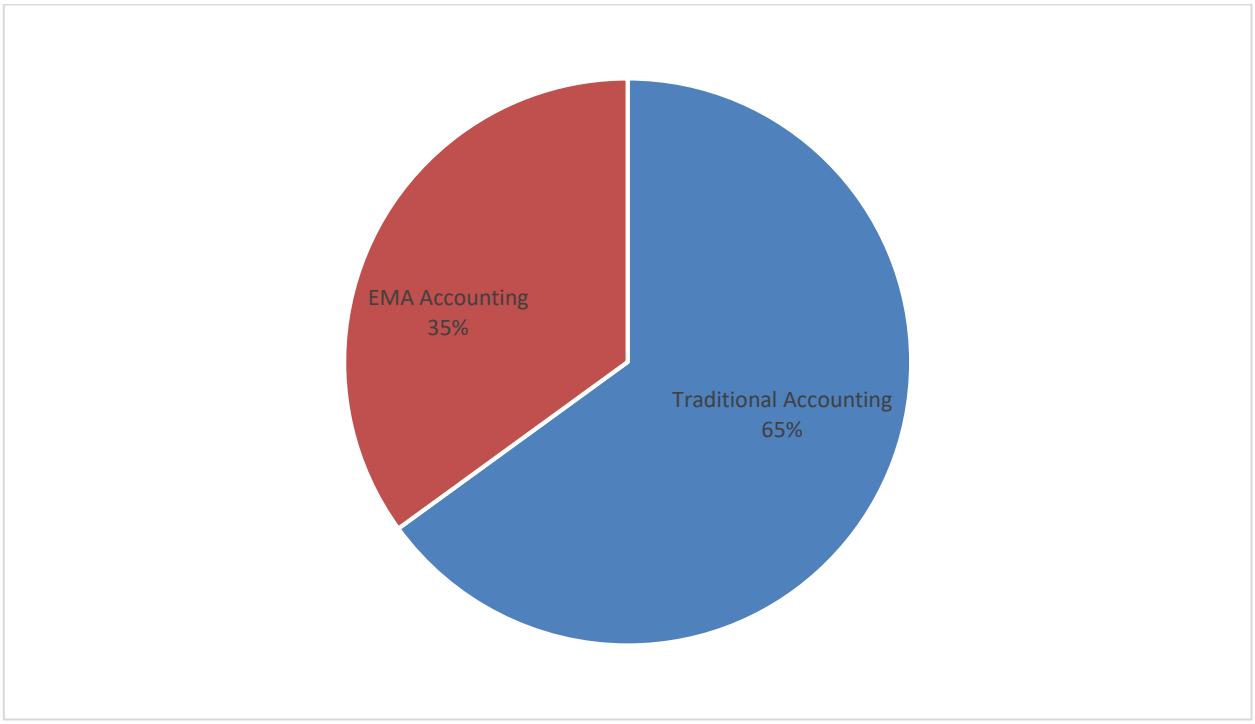

Figure 5.21 Preferred accounting system[18]

Source: Author

Sixty-five percent of the respondents believe that the traditional accounting system should be used, while 35 percent of respondents believe that a system which caters for environmental accounting should be developed. This system should be completely divorced from the traditional accounting system. The 65 percent posit that the system should be integrated and believe that the traditional accounting system already caters for environmental reporting but should be developed further to ensure that environmental reports can be extracted from the traditional accounting system. Some respondents were of the opinion that a completely divorced accounting system will not work properly

[18] Refer to Appendix A: Questionnaire Section C Q 6

outside the existing accounting system. This is contrary to literature which posits that conventional accounting systems are not structured to handle Environmental Management Accounting issues and that the integration of the two systems will pose some reporting and costing challenges (Qian *et al.*, 2015). Thus, the International Federation of Accountants developed standards which caters for all kinds of reporting which affect different businesses, though many professional accountants need support to exploit the accounting system fully and to be able to produce different sets of reports.

The environmental reports are being catered for under integrated reporting which is a new phenomenon being introduced to the accounting fraternity which is almost like the traditional accounting way of reporting with an ability to incorporate environmental, social and economic aspects (Burke & Clark, 2016). Having a separate accounting system helps the tracking of costs separately and accounts them under appropriate costs centres. Cost categories will be easily classified and chances of some costs being hidden or being lumped under general overheads will be greatly reduced. The chances that sustainability reports will be produced for window dressing purposes will be reduced to a minimal level. The qualitative sustainability narrative reports will be accompanied by financial reports in monetary terms to enhance the understandability of the report for decision making purposes to different stakeholders. This new system of reporting will ensure that quality reports are obtained and a review of EMA systems is done regularly to achieve harmony in EMA reporting, and strengthen the decision arm of the company that depends on the production of financial and environmental reports. This will reduce the adverse effect of *"Conventional management accounting which seems to miss-allocate environmental costs. EMA will assist not only in proper allocation (economic) but in mitigating adverse effects through physical flow analysis (environmental)" (P80:39).* The respondent quoted above asserts that management accounting on its own is not adequate to cater for environmental costs but a support mechanism through EMA will allow costs to be properly allocated and the physical flow analysis can be done right from the source.

It is believed, as literature suggests that the EMA applications are expensive and complex to implement (Jasch, 2006b; Michelon *et al.,* 2016). Such is not the view being held by the extractive industries as they believe the application of the system is not complex if the support mechanism is put in place and the system is regularised throughout the industry. The argument is supported by Qian *et al.,* (2015) who postulates that "*a more comprehensive consideration of EMA information is neither expensive nor difficult to implement if approached in an incremental manner based on the existing costing systems"*. It might be a challenge to start with but as support will be increased it will be like the traditional/conventional accounting systems which are being conducted with a lot of ease.

Resource extraction from the earth on its own is not sustainable if sustainability is measured based on environmental performance. Due to this adverse effect of the industry, the sector needs to be heavily regularised and environmental performance should be monitored to ensure that every adverse effect to the environment can be accounted for and reported accordingly. This sector of all other industries needs a separate accounting system which is divorced from the traditional accounting system because of its unsustainable nature. This will keep check and balance control mechanisms in place all the time and unsustainable mining could be monitored and mitigated in time. The EMA system in the mining sector will help to *"accurately, estimate/manage and reduce costs particularly environmental costs" (P91:26).*

The 35 percent who needed a new EMA system divorced from the traditional accounting system could give an explanation why it is important to have such a system (86 percent of respondents supported their view in support of EMA accounting systems) while 53 percent of people who indicated that the traditional accounting system is appropriate as it is did not support their opinions. Only 57 percent were able to support their argument for maintaining the traditional accounting system. One supported opinion why the traditional accounting system should be maintained indicated that *"Mining companies already have very expensive integrated ERP, systems that include traditional accounting. Migrating or adopting a new system will have low traction (ibid). What is needed is just an additional module for EMA aspects. Some of these systems already have the relevant modules*". This is to validate an earlier point in which the respondents indicated that support mechanisms should be put in place and EMA systems integrated into the traditional accounting systems which is believed to have these modules but the practitioners are not well versed in how to fully utilise them.

The mining sector is capital intensive and to have another accounting system separate from the traditional accounting system might discourage new entrance in the industry from investing in it. The new accounting system will require a lot of capital to set up on top of the heavy capital investments, therefore, the integration of the accounting systems under one system might prove to work properly in the sector. The view of the respondent is in sharp contrast to the one given above which pointed out that the sector is heavily unsustainable and requires accounting systems which cater for the environment. It should be pointed out that all the views are valid and make a lot of economic sense. The new start-up companies might see the investment in a standalone accounting system as a waste of resources which are needed for a company's survival. The system will be costly in terms of labour and maintenance. Efforts should be made to improve the existing traditional accounting system. Having two systems working hand in hand might complicate the reporting requirements in the sector. The traditional accounting system, as mentioned earlier, if given proper support can take into consideration social and environmental costs and benefits together with the financial aspect of

accounting. When the system was developed together with the International Accounting Standards it was meant to cover all financial reporting aspects which can be represented in monetary terms; those which could not be represented in monetary terms could be expressed under the notes section which accompany financial statements for decision making purposes. Although the system was developed to take care of the all reporting requirements, the practitioners and business owners should be cognizant of the changing times and operating environment which requires immediate change management.

5.6. Benefits of Implementing EMA in Zimbabwe

Extant literature indicates that EMA tend to benefit companies who implement it to the extent of giving a return on the investment in the modern green accounting system (Christ & Burritt, 2012; Lodhia & Hess, 2014). The observations were done in developed countries mostly but not largely tested in developing countries like Zimbabwe (Ambe, 2007; Kumah, 2006). EMA benefit Zimbabwe by ensuring the preservation of natural resources or the sustainable extraction of resources for future generations to benefit from the same resources and lessen the burden from the government to look after the natural resources after exploitation. The following subsections (macro Zimbabwe benefits, effects of EMA on company performance, government regulation, accounting specific regulations, effectiveness of regulations, motivation in implementing EMA, government incentives, and compliance to accounting regulations) will look at how EMA is benefiting Zimbabwe based on the views of the participants in the survey and the practitioners in the mining and extractive industry of Zimbabwe.

5.6.1. Macro Zimbabwe benefits

The study sought to understand if Zimbabwe will benefit from the implementation of EMA, checking the nature of the benefits which might accrue to Zimbabwe. The results are indicated on Figure 5.22 below.

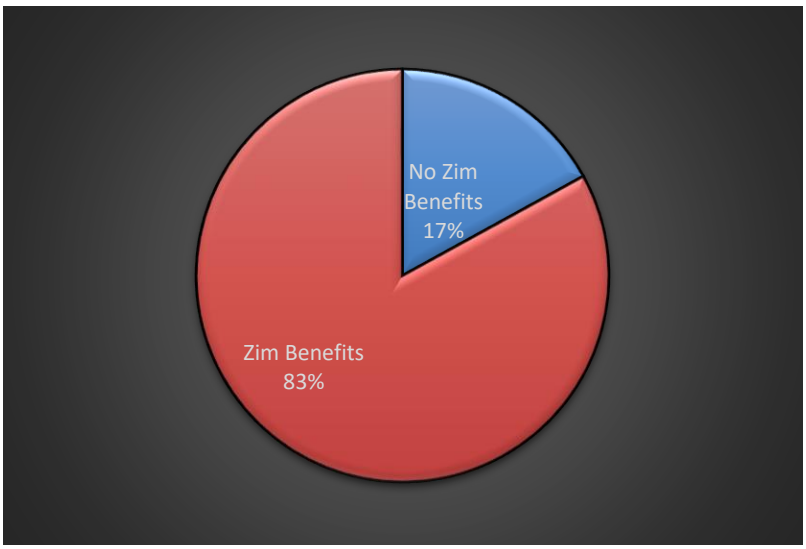

Figure 5.22 Zimbabwe benefits through EMA implementation[19]

Source: Author

Eighty three percent of the respondents indicated that Zimbabwe will benefit if EMA is implemented in the mining sector while 17 percent believe Zimbabwe will not benefit anything through EMA implementation. The benefits which accrue to Zimbabwe are because of environmental operation viability brought about by EMA applications and which cascade from the company level to national level. The nature of the benefits to Zimbabwe are listed in Figure 5.23 below together with quotations from some of the respondents which indicate how Zimbabwe will benefit from EMA implementation in the mining and extractive industry of Zimbabwe.

[19] Refer to Appendix A: Questionnaire Section D Q1

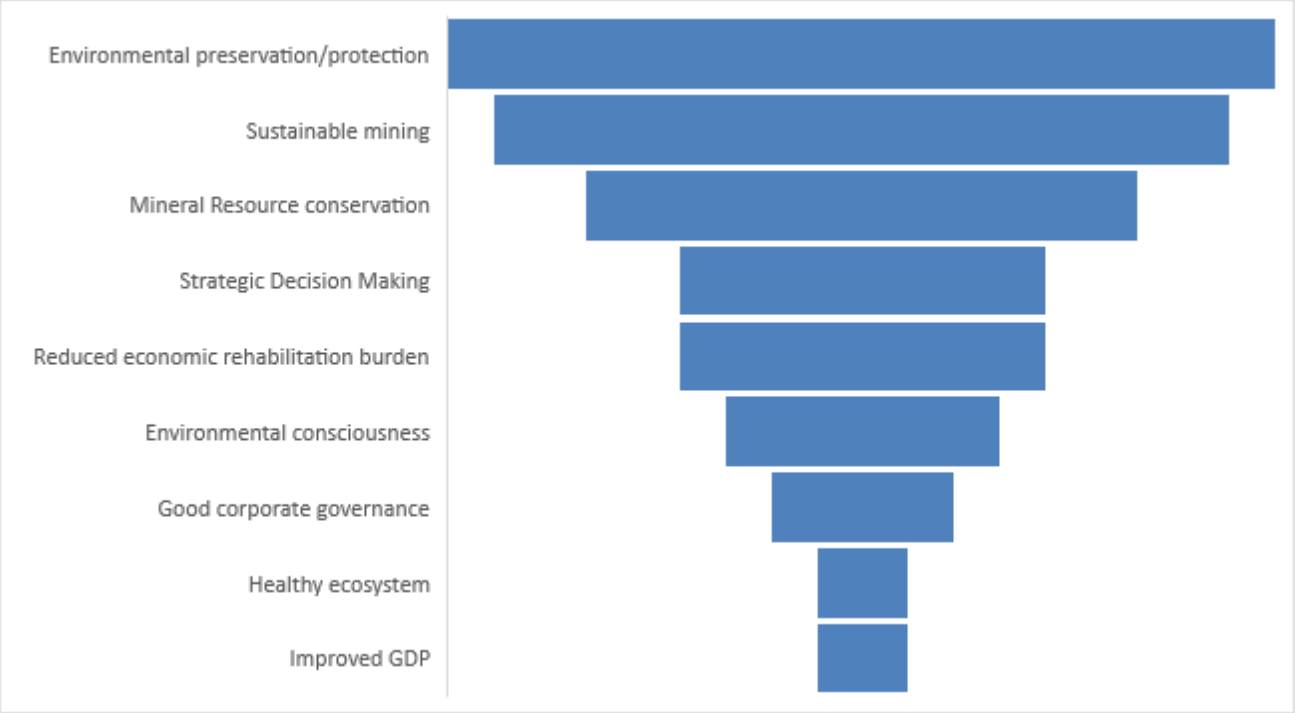

Figure 5.23 Nature of EMA benefits to Zimbabwean economy[20]

Source: Author

Chief among the benefits which were cited by respondents *is environmental preservation and protection*. Preservation and protection is a huge benefit to a nation which can be inherited from mining companies implementing EMA while the burden of protecting and preserving the environment will be carried by mining companies during their tenure of operation. All environmental negative impact can be mitigated against before they happen or can be avoided.

Sustainable mining is one of the major benefits, although mining will never be sustainable due to its nature but implementation of EMA to some extent ensures that mining is sustainable to some levels. This means the country and the company will monitor the amount of resources in the country and the possible benefits which can be obtained against the cost of the extraction of the resources and the ultimate damage to the environment. Literature indicates that Zimbabwe is not aware of the value of its natural resources and is yet to allocate resources towards the exercise. Through EMA this exercise can be done with a minimum cost. Natural resources will be utilised efficiently and preserved thereby ensuring sustainability in the mining industry. Closely aligned to sustainability is the mineral resource conservation which is believed to be enhanced by taking care of the environment first. Sustainable mining has been clearly captured by the following quotation from the respondent, *"Long sustainable*

[20] Refer to Appendix A: Questionnaire Section D Q2

mining operations are only possible through EMA implementation as there will be orderly operations" (P82:36).

"An organisation's decision makers can use the physical flow data and monetary information provided by EMA to make decisions that impact both the environment and financial performance of the organisation" (P80:42). The quote indicates that strategic environmental decisions can be done at national level based on information from EMA reports. *"Data from EMA can be used for strategic decisions at national level, international level and regional level" (P89:36).*The environmental decisions will contribute positively to environment performance and the financial performance of the organisation. Significant knowledge deficiency in EMA will be reduced and decisions with a positive impact will be taken.

The next benefit theme is best captured by this quote, *"If mines operate sustainably, that protects the environment, less economic burden to rehabilitate the damaged or polluted environment through mining activities" P86:28.* The economic rehabilitation burden is reduced significantly if EMA is implemented, and that is a huge burden. Although the country has rehabilitation funds set aside throughout the mining companies' operations, there is limited monitoring of these rehabilitation funds to the extent that the government will end up taking the burden to rehabilitate or using up the rehabilitation funds. Therefore, the communities around the mining operations end up paying the significant social costs associated with environmental damage. In turn, the system will ensure that there is accountability and transparency (*"EMA Increases efficiency in management accountability, transparency and uniformity"* (P89:35)*)* between the government and the mining companies involved in mining and extraction of resources. The environmental accounts will be produced and the interested stakeholders can take companies and the government to account for the rehabilitation funds, unlike presently. It is not clear how much companies are setting aside as provision for rehabilitation programmes. Some rehabilitation programmes will prove to be profitable over the years and these should be accounted for by the government and affected communities should benefit from the programmes, thereby, accounting for the social costs they had to trade in for the mining operations to take place.

Companies tend to be environmentally conscious all the time if EMA is implemented. Even the accounting people will be more responsive to the effects of company operations on the environment. Environmental consciousness increases the *"ability to more accurately track and manage the use and flows of energy and materials including pollution/waste" (P91:29).*

EMA implementation is a sign of good corporate governance in the country, which is a required code internationally. *"Implementation would strengthen the effectiveness of the existing government*

policies by revealing the true environmental costs" (P91:27). This will strengthen the decision arm of the government towards environmental management and coming up with EMA policies like other governments in the developed world such as Austria, Japan and the USA. A healthy ecosystem is achieved and the GDP of the country can be improved if EMA applications are harnessed at national level because green markets are open and trading in the global market. Trading ratings of the country are improved. The next section will look at how EMA affects company performance.

5.6.2. Effects of EMA on company performance

Company performance can be measured accurately using financial reports comparing one year to the other over a period or through the construction of financial ratios. Opinion polls help a little in determining whether EMA can affect company performance, though the perception of people can shape the direction of the company and can have a positive or negative impact depending on the perceptions they hold. Figure 5.24 below shows the effect of EMA on company performance based on the opinions of the practitioners in the mining sector.

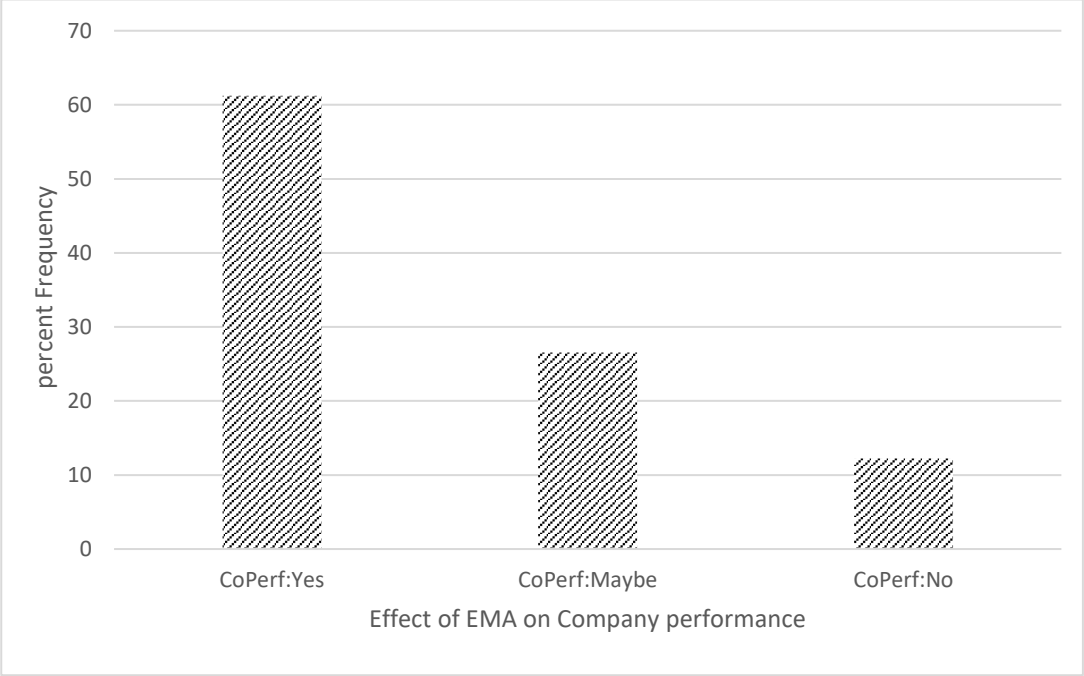

Figure 5.24 Effect of EMA on company performance[21]

Source: Author

Figure 5.24 above shows the effect of EMA on company performance. It can be seen from the table that 61 percent of respondents believe that EMA has a positive effect on company performance while 27 percent and 12 percent of respondents are either not sure about the effect or they believe that it doesn't have a positive effect on company performance respectively. Themes emerged from the

[21] Refer to Appendix A: Questionnaire Section D Q3

analysis of the reasons why respondents believed that EMA has a positive effect on company performance. In these themes several issues were identified and will be discussed in the following paragraphs.

Greener organisations tend to be more profitable overall, and EMA improves 'greenness'. In addition, cost accounting, containment and control are enhanced, hence increasing company performance. Cost control is a recurrent theme which has been coming out from the previous themes covered in the sections above. EMA can promote innovative thinking in environmental matters, as it is put across by one of the respondents "*Most environmental costs are not 'really' known. Such a gap does not promote innovative thinking like recycling, landfilling or incineration, depending on the nature of business"* (P80:32). Innovative thinking in terms of the environment can change the ultimate face of doing business and can transform a company significantly. A platform for innovative thinking can also be brought to the fore by using EMA systems, affecting company performance in a positive way. *"EMA brings about awareness on financial and environmental matters "*(P80:56) at the same time increasing the knowledge of EMA applications. This is supported by Schaltegger & Zvezdov (2015) who indicated that sustainability accounting is an organisational innovation. It also provides a platform for more innovations.

EMA helps in improving the already existing environmental management systems (EMS) which in turn benefits the company and ensures the citizens are living in a clean environment. Improved EMSs are a good environment for good company performance especially in the mining and extractive industry.

Company performance can be negatively affected and EMA costs money to implement by way of set-up, monitoring, capturing of data and training of personnel in EMA systems. This can deplete the company revenue. The increased costs might affect profitability in the short run with uncertainties of recovery in the long-run. These costs might affect employee performance through unattractive financial rewards which are prone to be maintained through the life of the mine.

It might not be clear whether the implementation of EMA will have a positive effect or negative effect on company performance because the availability or unavailability of EMA will not affect the production of the mining and extractive industries or companies. The companies will keep producing their resources, though the marketability of products produced under EMA will be another issue which must be considered at a later stage after production.

Company performance is dependent on several issues; one among them, is the position and approach of the company towards EMA. If the company is positive in its approach to EMA, company performance will be positive and if the approach is negative company performance will have a

negative effect. The company might decide to use the system in such a way that it benefits the company. There is therefore no one approach that is suitable for all companies in EMA. It is clear from this argument that an outright yes or no answer could not be given that EMA has a positive or negative effect on company performance. It can also be argued that compliance with EMA requirements opens doors of opportunities on the international market. There is also paucity of EMA knowledge in the industry which makes it difficult for companies to comprehend the costs and benefits of EMA as well as the impact of EMA on overall company performance. The cost burden of EMA makes the impact of EMA on company performance unclear. Proper implementation of EMA does not have negative consequences. But if costly approaches are used they can lead to significant financial losses. It is clear from operating companies that EMA is being implemented, though under various names, so there are no recorded negative effects on company performance for implementing EMA in mining companies.

5.6.3. Government regulations on EMA

A considerable amount of literature reveals that the mining sector is heavily regulated among other sectors of any economy either in developed countries or developing countries (see section 3.2.3). Such, is the situation in Zimbabwe where the mining sector is regulated by many acts. The principal regulations are the Mines and Minerals Act and Mining (Management and Safety) Regulations. Then there is the Environmental Management Agency Act, ZINNWA Act, Forest Act, Hazardous Substances Act and around another fifteen or so other regulations which are too numerous to mention here. *"These require certain activities to be done, recorded and accounted"* (P67:51). Another participant indicated that *"the environmental management agency of Zimbabwe (EMAZ) enforces environmental process compliance on behalf of the government through the environmental management Act. Other regulations are The Mines and Minerals Acts, Mining Management and safety regulations, the explosives Act, healthy and sanitation regulations"* (P80:44).

5.6.4. Accounting specific regulations on EMA

There is limited information about EMA accounting regulations in use in the mining industry of Zimbabwe from the practitioner's point of view. Lack of knowledge of EMA accounting regulations is huge in the mining industry of Zimbabwe. Most of the participants are aware of the International Accounting Standards (IASs) and International Financial Reporting Standards (IFRs) which are generic to all sectors of the economy which are in most cases used in accounting for environmental impacts. The following quote reveals the general lack of EMA accounting knowledge in the sector: *"I am unaware of any regulations specific to EMA but the accounting profession in Zimbabwe does*

follow various International Accounting Standards that include IAS37, IAS6, IAS16, IAS18, IAS36, IFRIC 1" (P 67:59).

Sixty one percent of respondents indicated that they are not aware of any accounting regulations which are environmentally related and the other 39 percent indicated other means of accounting for the environment which are not related to the reporting of environmental impacts in monetary terms which shows that the whole sector does not have accounting standards to go by when accounting on and reporting for environmental impacts, be they positive or negative. This is in tandem with literature which indicates that there are no standards developed yet for EMA, hence most companies in developed countries are using the IFAC guidelines from which they formulate their own policies which guide the development of accounting related standards in Environmental Management Accounting.

The respondents were not able to list any international regulations which have a possibility of affecting the implementation of EMA, further indicating the lack of knowledge in the industry about Environmental Management Accounting as a reporting tool and an environmental performance management tool. This further points to the lack of environmental accounting standardisation in the sector. Companies are at will to report what they deem fit under environmental accounting. It has been indicated by respondents that the accounting regulations on EMA are listed under general ISO standards and the companies ACT which are all generic standards with no specifics for environmental accounting.

5.6.5. Effectiveness of regulating the mining sector

There is need to know whether the government regulations in the mining sector are effective enough to reduce negative environmental impacts and to enable companies to make profits or continue in operation for a foreseeable future after the implementation of the regulations. According to one of the respondents, the principal mining legislation is fairly effective because it is enforced regularly. The Environmental Management Accounting aspects are non-regulatory so they are not as effective. The general regulations in the mining sector help only to a certain extent in reducing environmental impacts. That depends on how the government monitors the environment and the operations of the companies.

It is difficult to precisely indicate the effectiveness of international regulations or accounting regulations since respondents are not aware of these regulations, however, the government regulations are effective because of their punitive nature. Failure to comply with the regulations will result in heavy penalties which are not bearable. The government arm (EMAZ) needs to be capacitated (through funding) to monitor the effective adherence to a plethora of regulations in the mining sector.

The effectiveness of regulations should be considered on two levels: one level will be the ability to make a significant positive change in the sector and the other side to help companies make money. With that same view, the regulations are not being effective according to other respondents because they are one sided covering the environmental issues and not the economic aspects of the company. Every company will try to run away from costs, thereby avoiding regulations which might possibly eat into the revenue base of the company. In most cases the social aspects are not considered because their effect is not clearly visible. Those environmental visible aspects are taken care of at the expense of the other important social aspects which, when considered, will imply the effectiveness of regulations.

Regulations are usually effective because of the requirements in the industry and that makes them effective as summarised in the following quote from a participant: *"Mining regulations are mandatory and therefore compulsory. The extent to which a mining company does EMA is discretionary beyond the basic mandatory environmental and safety regulatory compliance. Listed companies do more EMA because of their greater mandatory requirements for disclosure and the danger to share value if gross violation is exposed"* (P67:64). The following section will look at the motivations behind implementing EMA though there are few and almost no regulations which govern the implementation of EMA in Zimbabwe.

5.6.6. Motivations behind implementing accounting regulations

Motivations for implementing EMA are wide ranging. A respondent indicated that "the principal motivation for the mining legislation is employee safety, prevention of wasteful mining and prevention of pollution" (P67:67). There is no mention of profit making in the motivation though a good working environment is a precursor to profit maximisation. Some companies are motivated by the need to keep the working environment safe for everyone around them.

One of the greatest motivators for implementing EMA accounting regulations is environmental preservation and protection. Despite that, companies need to make money. They are also concerned with the social aspects and wellbeing of the ecosystem and humans around the mining sites. There is no cost recovery which is sought by many companies other than being able to preserve the environment they are working in and ensuring that the future generations benefit from the same environment in a healthy and profitable manner. This has been described by other participants in the survey as social concerns from the local communities. As more companies join the industry they tend to know that the communities are more concerned about their environment and companies make it a priority that they preserve and protect the environment. Environmental preservation, likewise, covers

the safeguarding of the nation's natural resources, thereby promoting sustainability in the mining sector.

Closely linked to the above point, are the mandatory government requirements or government incentives (both positive and negative). The government through its monitoring arm, the Environmental Management Agency of Zimbabwe, requires mining companies to adhere to minimum environment requirements which, if not adhered to, attract a penalty as a negative incentive which forces many companies to comply. The agency does not share the possibilities of making profits through good ecological management.

Some mining companies are motivated by the idea of having a positive image to the other interested stakeholders which include communities they live in harmony with and other potential international trading partners. The good corporate image creates goodwill for the company and ensures the opening of good trading global markets which are not within reach if a company does not have a good green corporate image.

There are also incentives such as following industry best practices, that is, the culture of the industry, sustainable future achievement – ensuring that future generations can benefit from present operations, leaving a legacy for the future generations to tap into for their continued existence. Prevention of wasteful mining, pollution prevention, mining sustainability and preservation of natural resources are among some of the motivations for implementing EMA. It should be mentioned that there was no mention of harvesting the benefits of EMA through profits by the respondents which was believed to be a greatest motivator as literature confirms (See section 2.5). The benefits of EMA are long term and require huge capital investments but they will surely come. A subtle motivator which was not clearly brought out is the need for environmental performance by the companies. Environmental performance is of paramount importance in the mining industries and many systems are put it place to check company environmental performance.

5.6.7. Government environmental incentives

The government offers a limited number of incentives as a way of reducing environmental damages and the incentives are in the form of reduced licencing fees. The incentive given is rather a regulatory requirement for operations; it does not motivate companies to be environmentally conscious. It is clear that "*without incentives companies act per their own corporate social interests and limit the budgets for that because there is no full or partial recovery of the costs"* (P67:69). There is a negative perception that lack of incentives will give the implementing companies no reason to pursue Environmental Management Accounting as well as other environmental related initiatives. The lack of incentives works negatively towards the need for achieving sustainability in the sector. All the

gains which have been achieved in the sector towards mining sustainability will be lost if the government does not make initiatives to encourage companies to comply with environmental requirements. High chances of environmental degradation and pollution despite the availability of punitive penalties by the government are present without proper incentives. The value of preserving the environment and natural resources will not be appreciated if the initial steps towards that are not made by government even though it is the responsibility of the operating companies to ensure that they take care of the environment. To support the argument given above, one participant said, *"Besides fear of being fined there is no positive drive to implement EMA systems"* (P82:47) if the government does not provide necessary incentives.

Without proper incentives by the government, companies are encouraged to do the mandatory licencing duties and not to venture into other environmental initiatives or innovations which will help the companies and the stakeholders, including the government, to reduce the burden of rehabilitation and the health bill of the country at large. Some respondents who were not knowledgeable about environmental compliance incentives indicated that companies do not need any incentive to comply with government regulations but the need to protect, preserve and operate in a cleaner environment should be an incentive enough and a driving force for all companies because all livelihoods depend on a good ecosystem for survival. It is a need beyond profit maximisation that should be given more value and which is priceless and within reach of many companies if they need to pursue that.

The perception of respondents towards the availability of government incentives is shown in Figure 5.25 below:

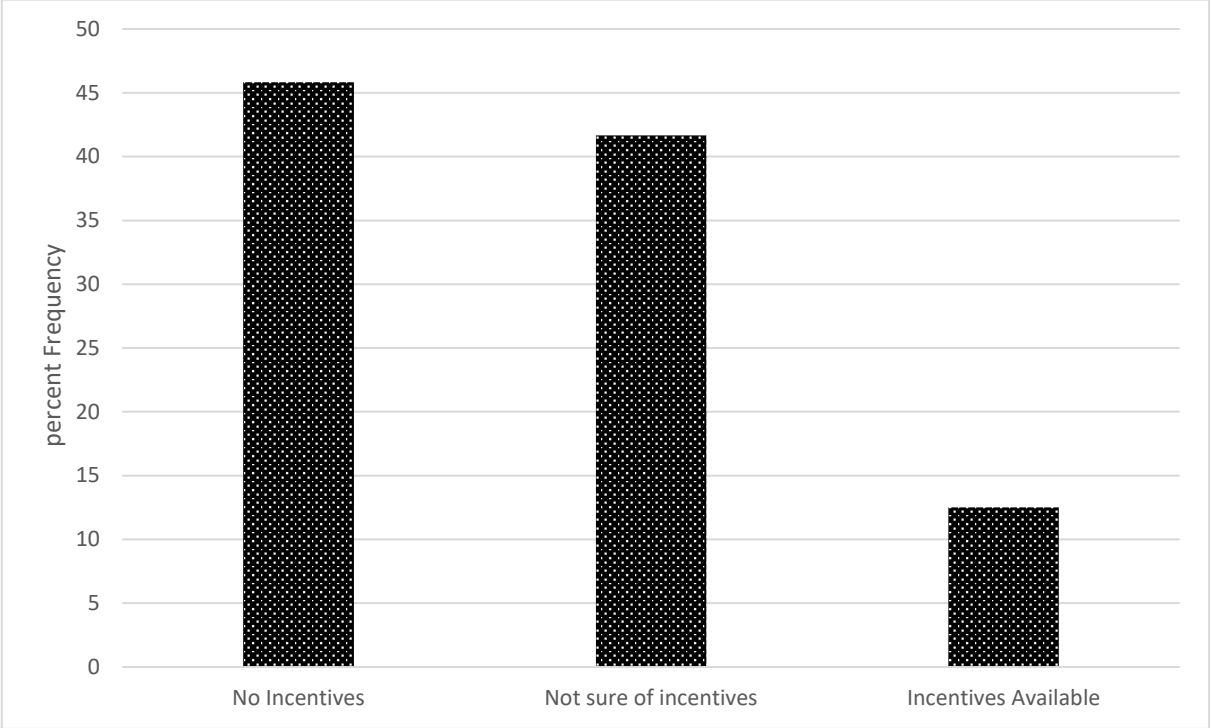

Figure 5.25 Government incentives[22]

Source: Author

It is clear from the above table that there are generally no incentives being offered to mining companies for complying with EMA regulations as indicated by 46 percent of the respondents. Forty-two percent of the respondents are not sure whether the incentives are available from the government or not. This gives mixed results from the participants about the lack of knowledge of the incentives considering that the people who responded are knowledgeable about EMA and work in departments which are involved in the implementation of environmental accounting.

The 46 percent and 41 percent are opposed by 13 percent of respondents who indicated that there are incentives for being environmentally conscious by implementing systems such as EMA or any system that ensures the environmental impacts are reduced to minimum levels. The incentives are in the form of reduced licencing fees, which many respondents saw as not being an incentive at all but a compulsory compliance fee as opposed to penalties which are paid for lack of compliance.

Figure 5.26 shows the impacts of not having government incentives according to the data 'groundedness' from participants who indicated that there are no incentives in the mining sector. The major impact is continuous environmental degradation followed by lack of positive drive towards environmental initiatives. Discouragement of pursuing sustainability issues is another impact of not

[22] Refer to Appendix A: Questionnaire Section D Q10

having government incentives. The lack of supporting incentives towards environmental management is a cause for concern in environmental management accounting practices.

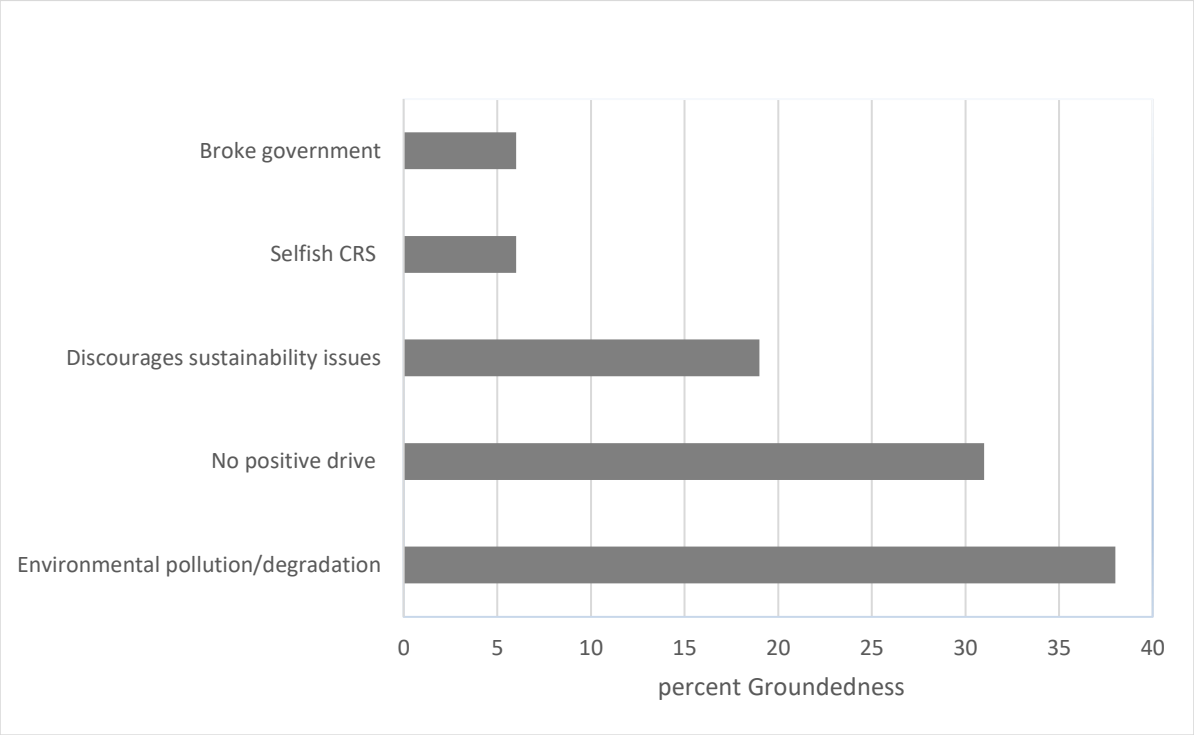

Figure 5.26 Impact of not having government incentives[23]

Source: Author

5.6.8. Compliance to environment accounting regulations

It was the aim of this research to find out if companies face any penalties for non- compliance with environmental accounting regulations and the severity of penalties to mining companies. The penalties have been cited in extant literature as a significant motivator for environmental compliance throughout the world (Qian *et al.*, 2015). The institutional theory states that coercive institutions (for example government) provide organisations with force to comply as well as rules and regulations to abide by (see section 2.4.1).

Figure 5.27 in form of a pie chart below shows the companies which suffer due to non-compliance to the environmental accounting regulations which were explained as falling under the regulated general accounting reporting. Environmental accounting reporting is regulated under the general accounting standards. There are no specific accounting standards to cover EMA only as indicated by the respondents; therefore, the regulations are generic to the accounting profession which covers both the environmental and financial reporting.

[23] Refer to Appendix A: Questionnaire Section D Q10b

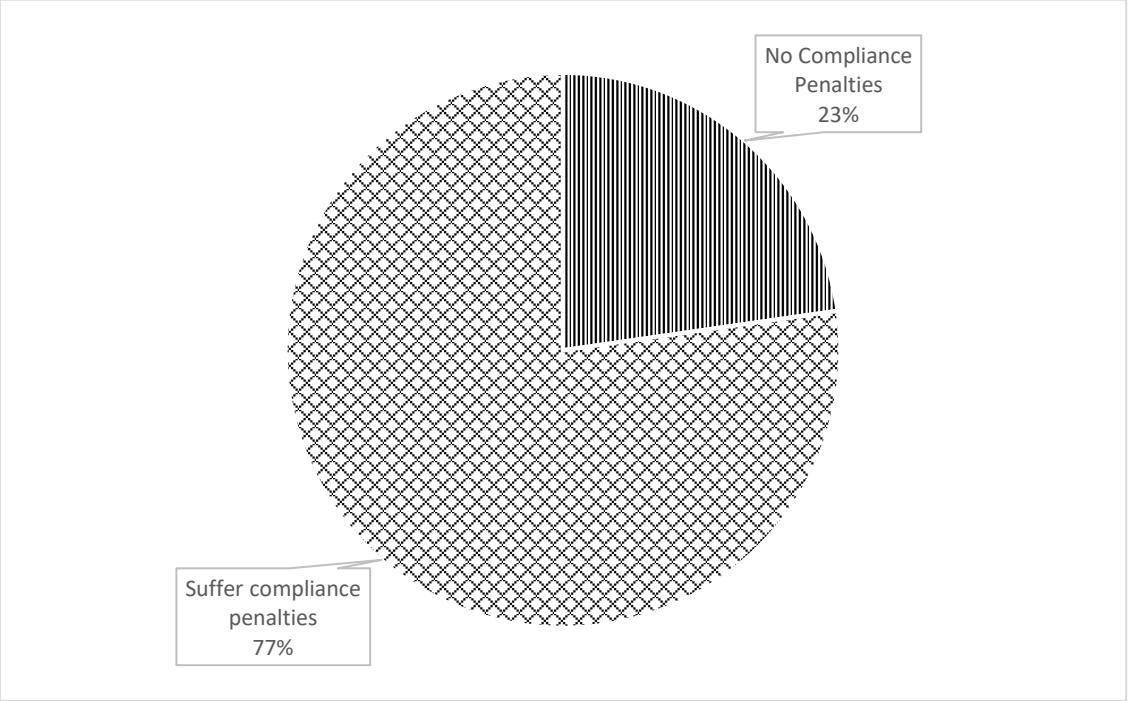

Figure 5.27 Compliance penalties[24]

Source: Author

Seventy-seven percent of participants indicated that their companies are facing significant compliance penalties if they do not comply with environmental reporting requirements which are stipulated in different environmental related acts, standards and regulations. Twenty-three percent of participants indicated that their companies are not facing penalties from government due to non-compliance to accounting regulations indicating that the only reason why they have no such penalties is they comply with government reporting requirements which were stipulated during the environmental impact assessment before, during and after the mining operations started. The companies follow these religiously in fear of heavy penalties to an extent of hiring consultants to do the requirements of different regulations on their behalf and the consultancy fees are not anything close to the penalties they will incur if they fail to comply. These environmental compliance consultancy fees are recorded under environmental costs with the benefit being cost savings in penalties, but the accounting of the savings is difficult to record in the accounting books and can be given as qualitative narrations only.

The researcher further went on to understand the nature of the penalties companies are suffering due to non-compliance with EMA regulations. The following six themes in Figure 5.28 emerged as the major penalties companies suffer from. The major penalties are in the form of pollution related penalties classified under effluent discharges/disposal and massive gas pollution fines as indicated in Figure 5.28. The other penalties threaten the existence of the company like the closure of operation

[24] Refer to Appendix A: Questionnaire Section D Q11

penalties and cancellation of operating licences, which is as good as being put out of business. The other least penalties are safety and healthy penalties and explosives penalties. These kinds of penalties are more common in the mining sector.

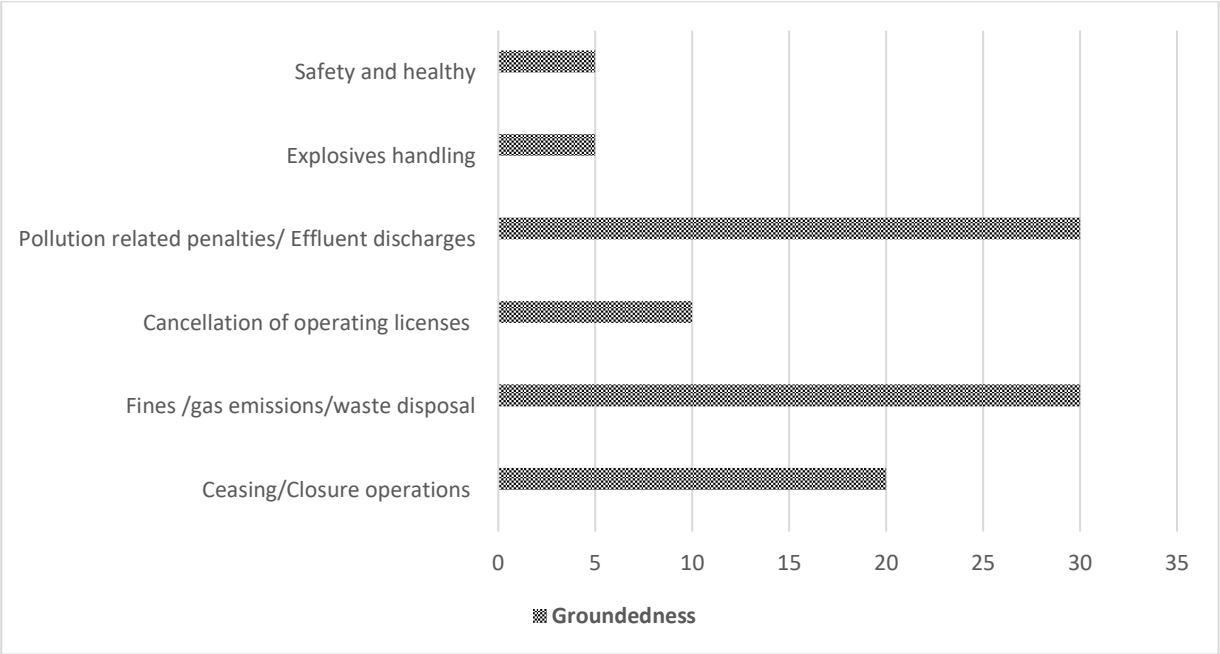

Figure 5.28 Types of penalties

Source: Author

5.7. Challenges in Implementing EMA

There are a plethora of challenges being faced by companies in implementing EMA. The challenges range from lack of funding to the complex nature of the concept of Environmental Management Accounting. The following subsections will discuss the hindrances/challenges in implementing EMA and financial performance as well as environmental performance.

5.7.1. EMA hindrances/challenges

Figure 5.29 below shows the numerous challenges or hindrances which are faced by the mining industry of Zimbabwe.

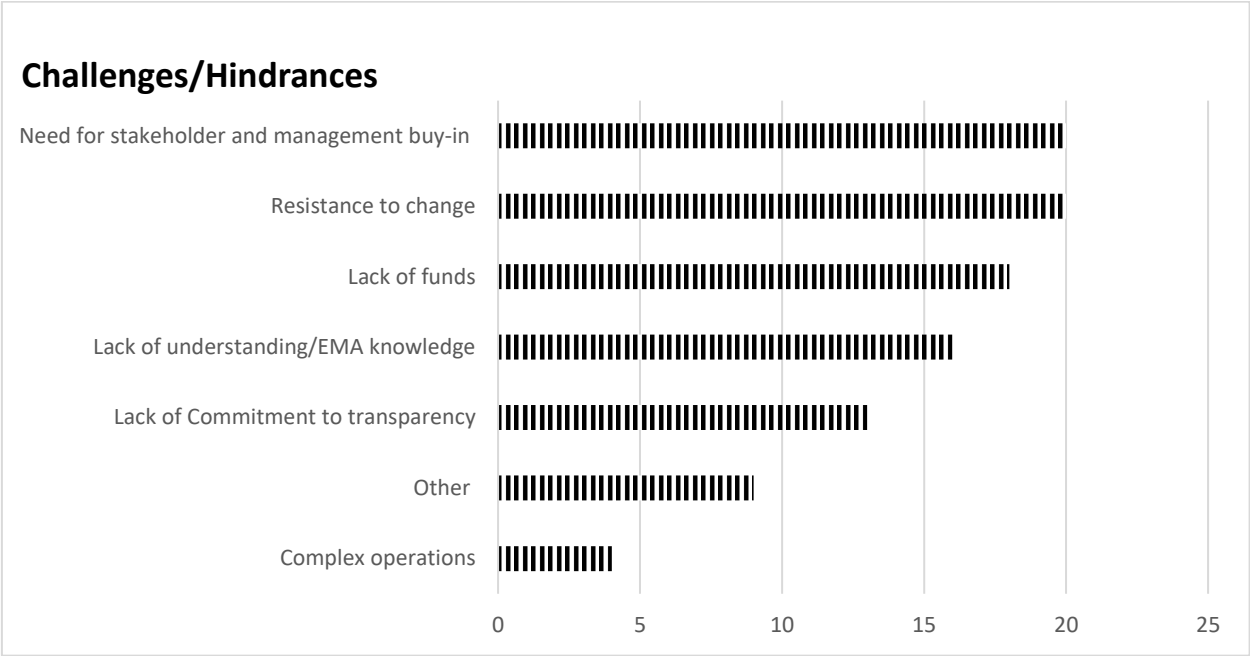

Figure 5.29 EMA hindrances/challenges[25]

Source: Author

The major challenge as indicated in literature are the huge capital investments which are required to start the implementation of EMA (Luther, 1996). These huge capital investments are outside the reach of many companies especially the start-up companies and those in developing countries. The irony in developing countries is that most of the companies operating are subsidiaries of major multinational companies who can practice EMA in their own companies located in the developed worlds. This is true of Zimbabwe with more than 50 percent of the mining companies being subsidiaries of major mining giants in the world (Mobbs, 2015). The results obtained from this study show a different land scape slightly contrary to that shared by extant literature.

The need for stakeholder and management buy-in: The major challenges as shown in figure 5.29 per thematic analysis of the responses from participants is the need for stakeholder and management buy-in and the cultural resistance to change in the norms of doing business, where companies are comfortable with maintaining the *status quo* or doing business as usual. The need for stakeholder and management buy-ins has been stated as the process of involving stakeholders in the decision making process in the hope of reaching a broader consensus on the organisation's future, that is, involving all interested parties which include customers, employees, board members, interested community members, employees who help in shaping the working of an organisation (Bradley, 2017). The

[25] Refer to Appendix A: Questionnaire Section E Q1

involvement of these people to work together as a team in issues pertaining to the environment has proved to be difficult in the mining sector.

Resistance to change: This a major challenge in the mining sector by both the mining companies themselves and communities. This is in line with literature which posits that local communities react not only to environmental impacts but also lack of representation and participation in decisions concerning mining activities in their areas (Conde, 2017). This explanation causes them to resist any change which the mining companies might try raise for discussion if they feel that they are not being represented enough. This also applies to mining companies if they feel that some aspects of operations are being imposed on them without their participation in the modalities of the mining industry and the operations of their companies.

Lack of funding: The theme follows as a third largest challenge in Zimbabwe. Contrary to literature, funding is not as huge a problem as resistance to change and the need for stakeholders and management buy-ins. There is widespread lack of/limited understanding of what EMA encompasses, hence companies do not have a standardised way of tracking and reporting on environmental impacts. The lack of knowledge in the subject matter leads to avoidance of the subject by mining executives, making it difficult to implement EMA and ultimately becoming a hindrance to the implementation of EMA.

General lack of commitment transparency: This a cause for concern especially in Zimbabwe where all the systems which increases transparency and accountability are avoided. There has been reported heavy capital flight and illicit financial outflows in the mining sector of Zimbabwe. The prominent political parties see all initiatives towards transparency as a huge threat to the survival of their cash cows in the sector and make efforts to frustrate all the moves by the sector to invest in systems which ensure transparency and accountability. The last and least challenge or hindrance to the implementation of EMA is the complex and diverse operations in the mining sector which makes the standardisation, tracking and reporting of environmental costs and benefits difficult. The sector is on record from United Nations Department of Sustainable Development (UNDSD) as having complex operations, thus, making it difficult to implement EMA in the sector and the progress towards standardising the sector is slow, and almost completely difficult to do (Jasch, 2006c; United Nations, 2001a, 2001b).

Other: In reference to challenges/hindrances in the mining sector some respondents indicated other challenges which were over and above the ones listed in literature and the questionnaire as major possible challenges. Some indicated that the system requirements for EMA are not strictly about financial accounting and management accounting but they encompass even the physical aspects of

reporting covered under physical Environmental Management Accounting (PEMA) which makes it difficult to integrate the monetary aspect of accounting (financial accounting) and the physical aspect of accounting (PEMA) into meaningful decision making.

Some companies are also facing challenges in fluctuating mineral prices on the world markets, which shifts the focus from environmental management and protection to increasing production to recover the costs and to be profitable at the expense of ecological management. The fluctuating mineral prices are influenced by the economic environment of Zimbabwe in which the minerals of the country do not attract high prices due to the political and socio-economic environment, as stated by one participant *"Economic environment currently prevailing in the country does not allow environmental accounting systems. Companies are failing to breakeven and capturing of such costs will result in more burden and losses"* (P78:56). Zimbabwe is not yet ready for EMA *("I don't think EMA is popular at the moment but to me (ibid) it seems it is the future of sustainable development since it combines two of the three pillars of sustainable development - Environment and economic pillar"* (P80:54) systems based on the slow developmental trend it is on, suppressed by the slowly performing economy.

5.7.2. Financial performance and environmental performance

Financial performance is the ultimate goal of most businesses except non-profit making organisations. The researcher went on to find if EMA would lead to financial performance and environmental performance of the company. Environmental performance is a precursor to good financial performance though it does not follow that if the company is not environmentally conscious it will not make profits. There is a lot of evidence in literature of companies who avoid the environmental aspects of operation under the guise of saving money and they record profits at the end of the operating periods. There profits were referred to as artificial (see section for example Deegan, 2013) There are also companies who end up crippling their operations due to the lack of environmental related systems. The results of the survey are given in Figure 5.30 below:

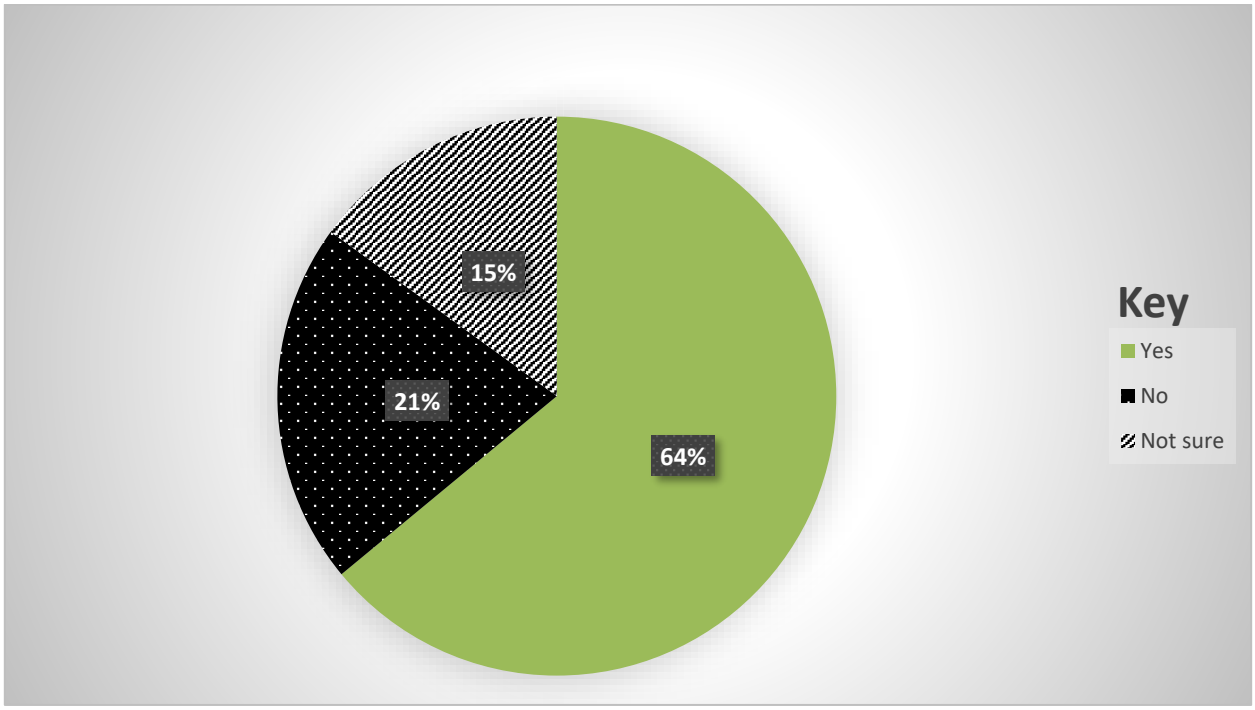

Figure 5.30 Financial performance and environmental Performance

Source: Author

Sixty-four percent of the respondents indicated that EMA could lead to positive financial performance and environmental performance while 21 percent believed it will not lead to a positive performance. Fifteen percent were not sure of the effect of EMA on performance of the company. Overall over 50 percent of the participants indicated that financial performance and environmental performance will be enhanced through the accounting systems. The respondents indicated that there will be massive environmental cost avoidance in the long run and that "*Most costs which are environmental that were/or are miss-allocated by conventional management accounting become exposed and they will be controlled more effectively"*. The introduction of accounting for environmental aspects in monetary and physical aspects ropes in the participation of the accounting team which is essential for good financial performance coming from the environmental side of doing business. This also ensures that the companies participate in lucrative and profitable world green markets. Knowledge gaps in EMA will be filled, thereby creating a platform for innovative thinking and accountability for resources to enhance decision making and transparency in the section which is essential for trading with global participants in the industry.

There is no doubt that environmental performance is a given positive benefit of EMA because the system on its own is more aligned to environmental aspects than the financial aspects. The impact of mining activities will be monitored on a day-to-day basis because information will be extracted from the physical flow accounting systems, in turn enhancing the sustainability of the sector. It is

imperative to mention that the participants who indicated that EMA will not increase financial and environmental performance did not give reasons for such assertions. The lack of supporting argument led to the idea that financial performance and environmental performance are increased by the implementation of EMA systems.

5.8. Role of Accountants in EMA Implementation

There has been a diverse and strong debate in literature over the role of accountants in environmentally related issues which include the tracing, tracking and reporting of the same. The role of accountants has been tested in the mining sector of Zimbabwe, a developing country and the opinions of the participants will be discussed under the following subsections: awareness of environmental related issues, team work, environmental related accounting, EMA application costs, benefits vs Costs and possible implementation alternatives.

5.8.1. Awareness of environmentally related issues

Professional accountants and environmental experts in the industry were given questionnaires and interviewed to check if they are knowledgeable about environmental issues that should be traced, tracked and reported on. The other experts were interviewed because of their interlinked work with the accounting departments, thus enabling them to give their opinions on their experiences working with accountants. The results of the survey and interviews indicate that accountants are not aware of the full spectrum of environmental related issues which should be traced, tracked and reported on. Accountants depend on the environmental departments heavily to articulate all required environmental issues which should be reported in monetary terms. The physical flow of information is usually done by the environmental specialist, and to some extent accountants will be involved in the costing aspect of the physical flow of environmental issues. The opinion is represented by 64 percent of the participants. The opinions are in line with literature which indicates that accountants are looking for relevance in an area that they are not knowledgeable about (Burritt & Schaltegger, 2010; Deegan, 2013; Schaltegger & Zvezdov, 2015). The studies were done in developed countries and as the literature review was not based on evidence from the field, the study vindicated the literature study but in a different setting of the developing country of Zimbabwe.

Thirty six percent (36 percent) of participants indicated that accountants are aware of environmental issues and the issues are articulated in the international accounting standards to guide the accountants in the implementation of EMA systems. The 36 percent is a minority group of participants, mainly including accountants themselves which might render the respondents to be biased towards their profession and also trying to get relevance in the new field of EMA, although their opinions are

supported by the International Federation of Accountants in their Environmental Management Accounting guideline (Jasch, 2006c) in which they posit that, though the role is not clearly visible accountants are very important in environmental accounting or sustainability accounting and there is always a conflict with the environmentalists who are of the opinion that accountants do not have a role to play in environmental sustainability under the auspices of sustainability accounting or social and environmental accounting. Some accountants indicated that accountants should be aware of their business environment and they are obligated to know because they have a mandate to report on the company activities in monetary and physical terms. At the same time they are involved in a crucial role of costing all processes and ensuring that companies are profitable. The results of the survey are indicated in a pie chart in Figure 5.31 below:

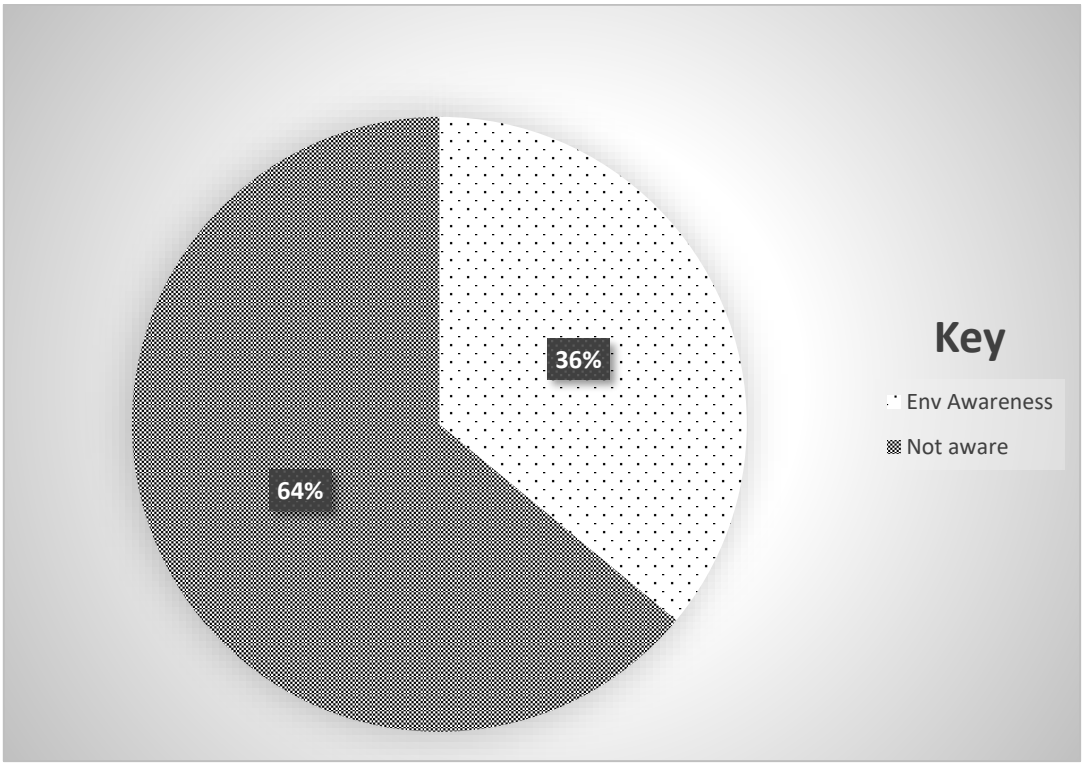

Figure 5.31 Accountants' awareness of environmental issues

Source: Author

It is clear from the above chart that 64 percent of accountants in the Zimbabwe mining sector are not aware of environmental related issues while 36 percent are aware of the environmental issues. This shows that there is need for supporting mechanisms to be put in place in the mining sector to ensure that accountants participate fully in environmental issues and are educated on how to use the guiding standards to trace, track and report fully on environmental issues. The accounting standards and guidelines on environmental reporting like the International Financial Reporting Interpretation Committee (IFRIC) 21 changes in existing, decommissioning, restoration and similar liabilities

covered under International Accounting Standards (IAS) 23 Provisions, contingent liabilities and contingent assets should be taught fully to practicing accountants in the mining sector through continued professional development workshops or other support mechanisms which can be developed in the sector. The following subsection will look at whether team work will be feasible in the effective implementation of EMA or whether accountants or environmental specialists have more to contribute.

5.8.2. Team work in effective implementation

Team work has been proved to be an effective way of implementing a system that is diverse and which requires a multi-disciplinary approach to operate such as Environmental Management Accounting which mixes environmental concepts as well as accounting principles for its effective operation. The environmental managers should work with accountants because both benefit from concerted, familiarisation with the concepts of EMA and each other's role. Team work encourages information sharing and asymmetry across the company and the industry. This means the conversion of physical data into monetary data is made easy with team work. Team work works well within the accounting professionals because accountants cannot work in isolation from other department functional areas. Team work is important "*for coordination and harnessing technicalities involved for better results and information and unnecessary duplication of roles"* (P89:59).

There was unanimous agreement that a coordinated effort is needed to reduce environmental impacts and maximise environmental benefits, there by embracing team work in the effective implementation of EMA. Environmental managers should make more effort to ensure that accountants can monetise the physical flow of environmental related activities. This can be achieved only if accountants work together with the environmental specialists. Schaltegger *et al*., (2017) in support of team work in EMA posits that accounting and reporting for sustainability requires a '*broader range of multiple intellectual resources from different business functions*'.

5.8.3. Environment related accounting and reporting

The respondents gave their opinions based on practice, on the professions which should be custodians of environmental related accounting and reporting. There has been a lot of debate in literature about the professional responsibilities in areas which are multi-disciplinary on who are the custodians of sustainability accounting. Accountants have been said not to play any role in sustainability or environmental accounting other than that of a supportive role and maybe being gatekeepers on behalf of the stakeholders who require different types of financial reports for decision making and to check the going concern of the organisation for investment purposes (Deegan, 2013; Schaltegger & Zvezdov, 2015). The respondents were asked to indicate whether accountants should be custodians

of environmental reporting and accounting or any other department. The results are indicated in Figure 5.32 below:

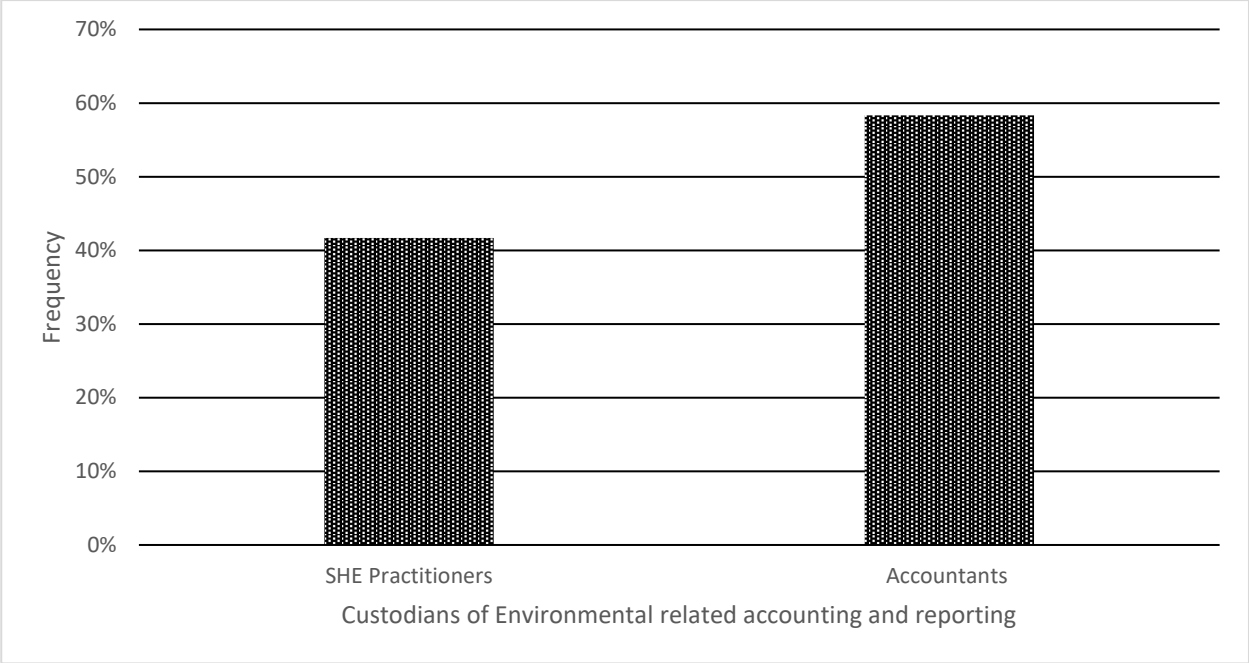

Figure 5.32 Custodians of environmental related accounting and reporting

Source: Author

58 percent of respondents indicated that accountants/the accounting profession should be custodians of environmental related accounting and reporting while 42 percent indicated that the environmental department or Safety, Health and Environmental (SHE) department should be the custodians of environmental accounting and reporting. The accountants have been picked because of their extensive knowledge in collecting, analysing and reporting information in a clear and understandable way. Though accountants cannot work alone in collating environmental information, they should work hand in glove with the environmental practitioners. The information sharing should be great in the two departments. The SHE department - also known as the Mine Planning and Safety Departments (in other companies in the mining sector) should lead environmental accounting with accounting professionals playing the supportive role.

The literature review posits that there will always be a conflict of interest in the two departments (accounting and environment) unless team work is carefully articulated and areas of operation clearly defined from the onset to avoid other departments overlapping in the work of other professionals. The environmental departments, represented by 42 percent of participants who indicated that they should be custodians, indicated that there is a threat of their function going to the accounting professionals who will end up being multi versatile to handle environmental issues if they relegate the environmental custodian duty to accountants. Employers will be obliged to employ accountants only

if they have the two skills (environment and accounting), and it will be difficult for environmentalists to move from their profession to the accounting profession.

One respondent indicated that "*The SHEQ department alone is not enough as it focuses on 'environmental issues only without an eye for the 'economic' I believe these two (SHEQ and Accounting) should work together"* (P80:63). There should be harmony in their activities and the two professions should work towards harmonising the two professions for greater benefits. The responsibility these departments have is a two-tier responsibility.

Extant literature tends to support the role of accountants in keeping environmental information, with hard debate from the environmental practitioners who indicate that accountants are seeking relevance in an area which is not theirs (Gray, 2010b). They are considered to be gatekeepers of sustainability information with little they can offer (Schaltegger & Zvezdov, 2015). The results obtained from the Zimbabwean extractive industry and the mining sector support extant literature (See section 2.3.3) that accountants should be custodians of environmentally-related accounting and reporting. It is important to mention that the difference in results is insignificant or very minimal which can warrant a conclusion that a coordinated effort is needed within the two professions for a greater benefit to the company and the professions in as far as proper decision making is concerned.

5.8.4. EMA application costs and complexities

The fourth question in section F of this research sough to understand if EMA applications are expensive and complex to implement in the mining sector, this being informed by extant literature which indicates that EMA systems are expensive and complex to implement in the mining sector (see section 2.6.4). The current study shows contrasting results to what literature and previous studies have found. The results are shown in a pie chart in Figure 5.33 below:

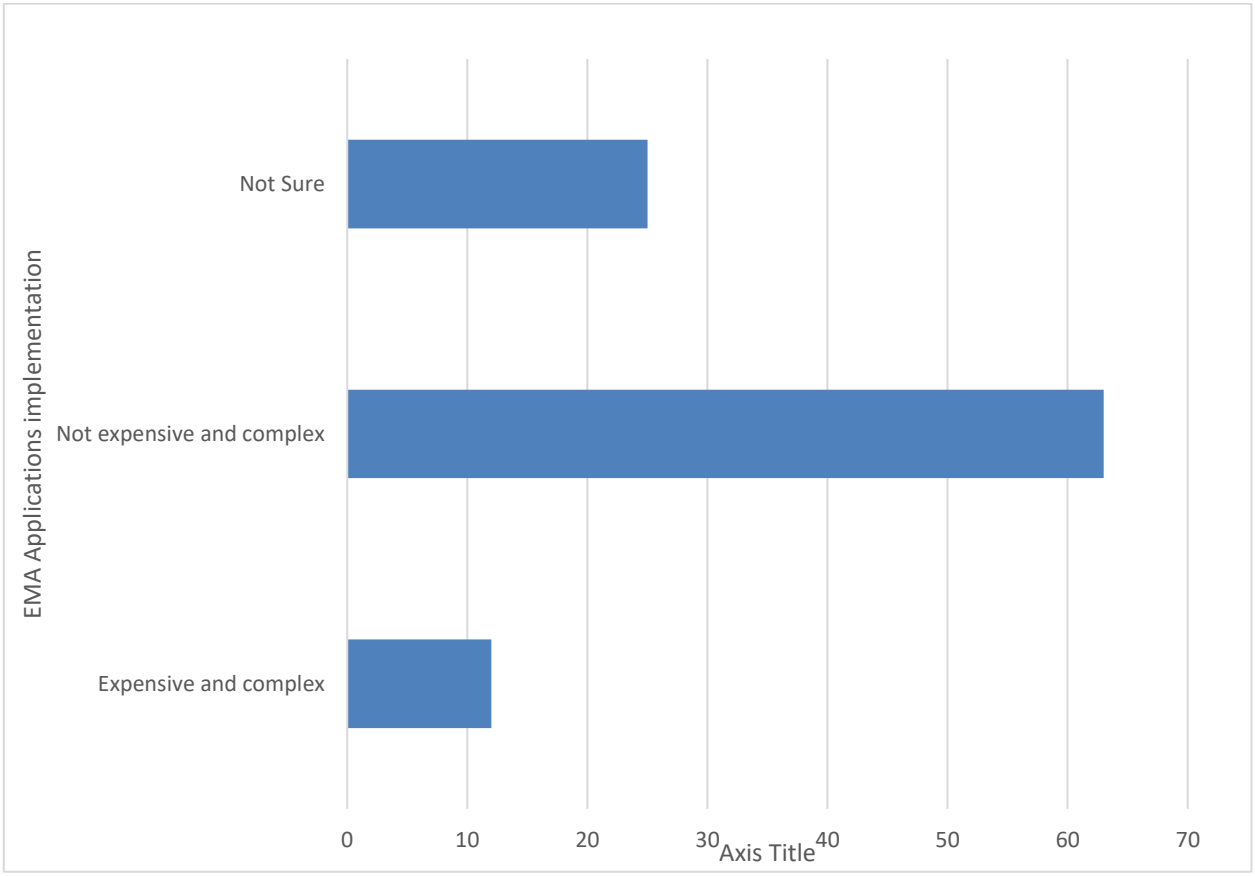

Figure 5.33 EMA applications costs and complexities[26]

Source: Author

From the data in Figure 5.33, it is apparent that 63 percent of participants indicated that EMA applications are not expensive or complex to implement against 12 percent and 25 percent who indicated the application are expensive and they are not sure respectively. The results show a contrasting dimension to that presented in literature (see section 2.1.3). The 12 percent who indicated that EMA applications are expensive were further questioned as to why they think it is expensive and how much it can cost to implement in their companies based on their experience and knowledge working with environmentally -related issues. It is important to mention that the participants indicated that "being expensive" is relative depending on the size of the company, annual revenue or profit margins, subsidiaries the company has and capacity utilisation in different mining companies. However, the costs of operations must be spread evenly throughout the year. The spreading of these costs can make the operations very complex because they must be reduced to day-to-day operations.

The cost range of implementing and operation ranges from $10 000 to $500 000 depending on the company size based on different size measurement criteria. These are not only start-up costs; there are also running costs which will be incurred on a monthly basis of the operation of the system which

[26] Refer to Section F, Q4 of the questionnaire in Appendix A

could not be given accurately or be estimated. The costs of maintaining the system and labour to staff working on the system could be estimated using prevailing market rates in the sector. Some companies believed the costs depend on the consultant who will set up the system first, and that can only be obtained once a tender for the job is sent out and best companies bid for the job. Only then can the costs of implementing be known in the sector with ease. Estimating costs out of the blue can be difficult since most of the companies have never done a fully-fledged Environmental Management Accounting implementation cost analysis or feasibility study, which is the first thing to be done before a system is implemented. What has been happening currently is the integration of EMA activities in the current accounting system with minimal environmental costs in the form of environmental compliance related costs.

5.8.5. Benefits vs. cost

Cost benefit analysis is at the heart of most businesses before they implement a project and the same happens in EMA implementation. It was important to understand the opinions of the mining sector of Zimbabwe on their perceptions whether the benefits of implementing Environmental Management Accounting can outweigh the lack thereof. Literature is full of evidence which suggests that, no matter how huge the costs of implementing EMA might be, the benefits which will be gained from the system outweigh any costs. This conclusion is based on empirical evidence from international companies which have implemented the concept and are reaping the benefits not only in monetary terms but also in environmental performance (see section 2.5) (United Nations, 2001b). Big multinationals have recorded high profit margins years after the implementation of sustainability accounting concepts. Figure 5.34 below show the results of what people in the Zimbabwe extractive industry and mining sector think of EMA.

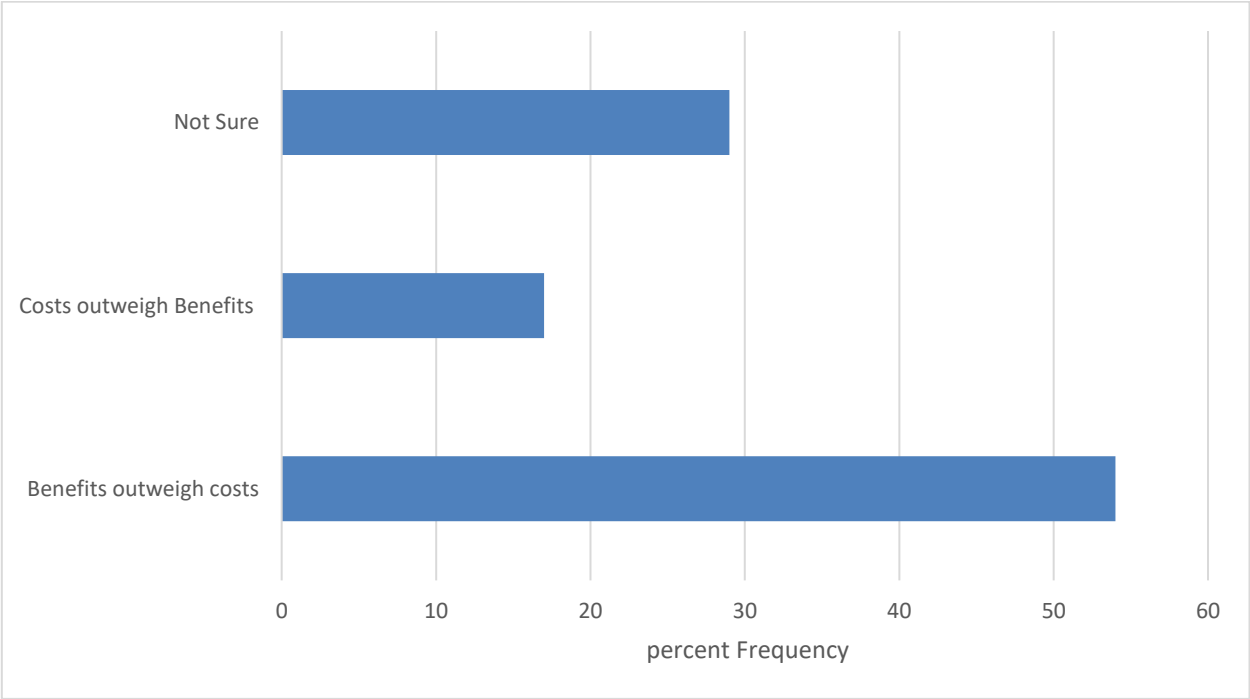

Figure 5.34 Benefits of implementing EMA against costs

Source: Author

As Figure 5.34 shows, there is no significant difference between responses which show that benefits outweigh costs (54 percent) and those which indicate that costs outweigh benefits (17 percent) and those who are not sure (29 percent) in total representing 46 percent of respondents who are either not sure or who think that costs outweigh the benefits. There are no significant differences between the two groups of responses. Literature (See section 2.5), however, posits that the benefits of EMA are greater than the costs which can be incurred in setting up and running the system. It can be argued that the phenomenon might be true in developed countries rather than in developing countries, since the empirical evidence is based on developed countries' economies which are advanced in harnessing the full potential of environmental accounting. Companies in Zimbabwe, are gasping for survival hence any cost towards 'green accounting' might be viewed as an expense rather than an investment which can be recovered over the life of the operation. It was evident from the responses that the participants were cognisant of the fact that EMA reduces costs in terms of penalties or liabilities which might accrue to companies. The reduction of costs in turn increases profits.

It will not be conclusive to say the benefits outweigh costs since we have several respondents who were not sure whether EMA benefits can be above the costs. If we compare those who are sure (54 percent) and those who believe that costs can outweigh the benefits of EMA (17 percent), however, we can clearly conclude that the costs can be recovered after the implementation of EMA. It will be difficult to generalise the results, as they are inconclusive and will need empirical evidence based on

companies who have implemented EMA over a period of time in the mining sector and extractive industry of Zimbabwe.

5.8.6. Possible alternatives to implementing EMA

The study sought to understand the best possible way of implementing EMA and a scale was given for respondents to indicate by ticking a box of what they think is the best way, with an alternative column which was open for them to suggest what they think is the best way. The results from the respondents are given in Table 5.2 below with the cumulative frequencies of their responses:

Table 5.2 Implementing EMA in the extractive industries and mining sector

Possible ways of implementing EMA	**% Frequency**
Through use of existing accounting systems	14
Through use of new accounting systems which cater for environmental aspects	26**[27]
Through environmental managers	33**
Through engineers	7
Through management	19**
Any other (specify)	2

Source: Author

The implementation of EMA through environmental managers is in line with the results obtained in section 5.8.4 in which respondents indicated that the environmental department should oversee environmental reporting. Hence, if they are in charge they should also be fully responsible for the implementation of EMA.

In other ways of implementing EMA, the participants pointed to the importance of modifying existing accounting systems to cater for environmental aspects. The only aspects being reported in the current accounting system are the recording and reporting of rehabilitation fees and penalties related to the environment and the accompanying possible provisions and liabilities as indicated in the IFRICs.

Jasch (2006a) indicated that the functional departments should come together and brain storm the best possible ways of implementing EMA and, if done properly, the environmental categories which are critical for recording in physical and monetary terms can be identified in one day. There is no one

[27] ** Indicates the possible ways of implementing EMA with the highest percentage frequency from the data collected.

possible way of implementing EMA. The differences are not significant between use of new accounting systems, environmental managers and management as indicated by the asterisk (**). The results point to harnessing the suggestion by (Jasch, 2006b) that departments have to come together and map a way forward. In the case of the extractive industry, the representatives in different departments should come together and map a way forward on the implementation of EMA since the area requires a coordinated effort from different professionals for the approach to be effective. The different and diverse group of individuals from mining companies enables companies to take into consideration the different complexities in different companies for effective implementation of EMA in the mining sector. Schaltegger *et al*., (2017:118) argues that even though the new accounting systems are needed, 'at present little is known about how companies choose, introduce and use new methods and processes of collecting, processing, analysing and communicating sustainability information'.

5.9. Summary and Deductions

This chapter discussed Environmental Management Accounting perspectives in Zimbabwe extractive industries based mainly on the opinions of the practitioners, that is, accounting professionals, environmental practitioners and to some extent engineers. The chapter was divided into five sections covering the research objectives set out in chapter one. The discussions were done following data presentation and analysis in line with current literature reviewed. The results have indicated that EMA has an ability to promote mining sustainability in the sector if correctly implemented and the participants were aware of what mining sustainability entails since most of the respondents had minimum qualifications required for literacy and to understand the phenomenon which was being discussed. There are diverse perceptions of the significance of EMA in the mining sector with different terms being used to refer to EMA. What is clear is that EMA is being practiced in the sector though without reference to the terminologies given in literature but under the auspices of environmental management. There is clear evidence from the field work that EMA has the potential to benefit the mining sector, in helping accountability and transparency in the sector which is very rare in Zimbabwe across the sector. Company performance and financial performance are enhanced if EMA is implemented. The results of this study indicate that the mining sector is heavily regulated, but the regulations are largely towards environmental health and management and not aligned to environmental accounting. Environmental accounting is said to be covered under the IASs and being overseen by the Public Accounting and Auditors Board of Zimbabwe (PAAB(Z)). There are no motivations put in place by the government of Zimbabwe to encourage the adoption of EMA and environmental regulation rather, there is a stick in the form of heavy penalties for failure to comply

with regulations. This kills the drive to initiate sustainability accounting, as the sector is conscious only of complying and not improving the accounting of environmental issues for their benefit and the economy at large. There are, however, a diverse range of challenges in implementing EMA ranging from lack of funds to the complexities involved in setting up EMA in the mining sector. The role of accountants in EMA was put under a microscope and it was found that accountants cannot work in isolation from environmental practitioners. Instead, there should be a coordinated effort towards the overall achievement of implementing EMA in the mining sector. Environmentalists are also protective of their turf lest they relegate their importance to accountants who will be able to multi task and take their duties on the job market. Lastly, the section concluded by pointing out that EMA applications are not expensive and complex and the benefits of EMA can outweigh the costs thereof. There is also no one universal way of implementing EMA but companies must assess the best way of working together and operationalise EMA systems through a coordinated effort.

CHAPTER 6
MODEL FRAMEWORK FOR ZIMBABWE'S EXTRACTIVE INDUSTRY

6.0. Introduction

The study culminates in the proposal of a model framework for Zimbabwe's mining sector and extractive industries. The model framework is, largely, based on literature closely related to developing countries and empirical evidence gathered during data collection. This framework is robust in nature because of the approach taken in developing it, which is, combining literature and the practice in Zimbabwe. The operating environment in which most frameworks were developed was based on the developed countries' perspective. These countries are different from Zimbabwe, which makes the adoption of international frameworks difficult.

EMA model framework can also be called a framework of decision making because it recognises that decisions vary in terms of the type of data (monetary or physical), scope (past or present), range (short term or long term) and periodicity (regular or a*dhoc*). The data gathered should reflect all the aspects of the decisions to be made (Burritt, 2005). Other authors (see for example, Azapagic, (2004)) give the sustainability indicators in their framework, to intentionally incorporate the issues of sustainability in it and for easy standardisation of sustainability accounting. The sustainability indicators are usually common in the minerals industry (Lodhia & Hess, 2014). Typically, the environmental management framework consists of the economic, social, environmental and integrated indicators (Lodhia & Hess, 2014). To achieve the purpose of the study the researcher sought to understand how EMA is being implemented in the extractive industries and mining sector of Zimbabwe. The framework helps in ensuring the direction the implementation process will take. This chapter will look at environmental management overview, the purpose of the framework, the traditional accounting paradigm, the current proposed framework implementation process, environmental management accounting tools, and finally EMA systems dimensions.

6.1. Hindsight on Environmental Management Accounting

Environmental management accounting is a new approach to improve environmental performance of companies (see section 2.2). The implementation of EMA is vital for improving transparency to internal and external stakeholders (Dumay *et al.*, 2016), especially to those stakeholders who are more concerned with the environmental performance of companies operating in the mining sector (Kamruzzaman, 2012). There are many complexities in the mining sector and extractive industries which can be overcome through the implementation of EMA (IFAC 2005; United Nations 2001b).

IFAC (2005) and United Nations (2001b) call for governments to develop country specific guidelines as well as sector specific guidelines.

EMA seems to be a coercive regulatory system which increases the regulation of the mining industry (see Chapter 3 for more information). There are numerous monetary benefits which companies can harvest through its implementation. This framework will not act as a universal solution to all the mining companies, since the operations of the companies in the sector differ largely. Companies need to adopt what is applicable to their operations just as in the financial accounting framework. Alcouffe *et al.*, (2010) indicated that there are always limits in implementing EMA in organisations within the extractive industry. This was in reference to less specific frameworks which are taken from developed countries and used as they are in developing countries. The limits are as a result of endless search for precision in EMA and impossibility to obtain environmental related costs.

EMA requires attention to detail and, collaboration with experts in different fields. The environmental accounting costs, on their own, do not tend to be hidden in overheads but they are not easily visible (see section 2.3). This makes it easy for most companies to neglect the environmental costs associated with activities. The companies fail to list all constituents of environmental costs and benefits. These constituents become apparent only when the system is running and the initial steps towards implementation have been made. There has to be a deliberate need for companies to identify environmental impacts for their eyes to be open to small environmental costs and hence, companies hire experts to help identify these seemingly not visible costs. Alcouffe *et al* (2010) raised the need to revise the purpose of an environmental system and assess the environmental dynamics. Therefore, in the initial stage of this model framework, it is imperative to clarify the purpose of the framework.

6.2. Purpose of the Framework

The environmental management accounting framework's purpose is to help companies who operate in the mining sector and extractive industries to identify, track and trace environmentally related costs and benefits; to be able to analyse the different environmentally related costs as to their materiality and measurement; to disclose environmental costs and come up with environmentally benign decisions which ensure that companies and various stakeholders benefit from them at the same time increasing the environmental performance. This model framework is a way forward for management of the companies in developing countries who are seeking to adopt EMA systems as a way of mitigating environmental impacts, and aid in the corporate governance as well as the corporate social responsibility programmes of their companies (Burritt *et al.*, 2002). The framework helps in reflecting on the internal as well as the external users of environmental accounting information at the same time attempting to define EMA (Burritt & Saka, 2005). It is important to indicate that when EMA is used

for external reporting, it is referred to as environmental financial accounting (EFA). EFA provides information to external stakeholders on organisational performance (Jasch, 2006b). The identification for the need of monetary and non-monetary information about the environmental impacts and on the organisation to be gathered and tracked by management is made possible through EMA systems for either internal reporting purposes or external reporting purposes (Burritt & Saka, 2005).

The lack of EMA framework to map existing EMA tools hinders its wide spread use and adoption (Burritt *et al.,* 2002). This is because the guidelines are not clear on which tools are pertinent for which business decision context and actors. The previous frameworks have weaknesses as pointed out by Burritt *et al.,* (2002) because they are not anchored in the broader concepts of environmental accounting such as PEMA, MEMA, Life Cycle Costing, monetary external environmental accounting (MEEA) and physical external environmental accounting (PEEA). The developers and implementers of EMA frameworks have to realise that there is a range of factors which support the development of the framework and these factors range from the lack of common terms describing EMA, theory/practice gap conceptual separation, and different information needs by management involved in environmental issues (Burritt *et al.,* 2002). Data collected has shown that the companies in the extractive industries and mining sector are using various terms to refer to EMA. The scholars (see for example, Burritt & Schaltegger, 2010; Gray, 2010b; IFAC, 2005; Thornton, 2013) themselves are not in agreement as to whether they stick to EMA, sustainability accounting, social and environmental accounting or simply environmental accounting in reference to accounting for environmental impacts in the company's accounting systems. This is one terminology example, but there are various terms which are not standard, which the profession has to agree to standardise for easy application and comparability purposes (Cortese *et al*., 2009).

The focus of this specific framework is on organising the various individual approaches to EMA into a single coherent framework for Zimbabwe and other developing countries as per requirements of United Nations, (2001a). The Japanese Environmental Agents (JEP) came up with three standard frameworks to report or disclose environmental accounting information related to environmental impacts and/or performance (United Nations, 2001a). Japan is an example of the emerging markets who are embracing EMA initiatives in most of their industries because of their huge developmental projects which have a potential to affect the environment in a negative way. The UN gave Japan as an example of the governments that are embracing environmental accounting to achieve sustainability in various sectors.

Sustainability guidelines are helping in consolidating various approaches into sustainability accounting (SA) framework (Lamberton, 2005). This has been criticised by EMA proponents (See for example Deegan, 2013) as giving a challenge in EMA implementation by making use of the

conventions which are not working properly. EMA needs to come up with their conventions and develop them over time, improving them steadily until the overall goal of EMA is achieved. Lamberton (2005) also noted the difficulties in determining estimates of sustainable costs which result in recasting of the sustainable cost framework to provide data concerning range of more sustainable practices. Lamberton (2005), proposed that the companies should be in a position to determine sustainable costs. The process of determining sustainable costs is a scientific one and requires substantive tests and procedures. After these costs are reached by companies, there is need to determine a way forward for the companies and that includes the decision whether a company continues in operation after paying a fine or it closes the business. The fine, is not sustainable in nature unless the fine is able to mitigate the unsustainable practices of the companies, which in most cases has proved not to be easy.

Lamberton (2005) proposed that, the following assumptions add rigor and structure to the reporting of sustainability accounting information: objectives, principles, data, accounting records, measurement techniques, reports, and qualitative attributes. The primary objective of any sustainability accounting framework (SAF) should be to measure organisational performance towards the objective of sustainability. The reports on organisational performance should be from the ecology, social and economic perspective. The performance should be measured directly based on sustainability indicators and at the same time definitions should help in shaping scope and content of an organisation's sustainability accounting framework which simply is environmental management accounting.

Most organisations use legitimacy theory to analyse environmental disclosures from a reputational risk perspective (Alewine, 2010). The reputational risk's perspective angle which the organisation will be coming from needs to be understood by the users of the environmental information so as the purpose for which the reports are made. The purpose of environmental reports should be agreed by all departments within the company. Environmental accounting auditors should have the physical indicators to check the motive of different environmental disclosures. This helps in expressing an assurance opinion on environmental reports to safeguard stakeholders (Jasch, 2006: 1195). Expressing an assurance opinion is a challenge to environmental accounting auditors because companies might suffer reputational risk even with the auditors assurance (see for example companies like Enron, Exxon Valdez, Worldcom and Parmalat) (Fleischman & Schuele, 2006; Jones, 2010; Kershaw, 2005; Owen, 2008; United Nations, 2008;). The environmental auditors have limitations to the scope of the things they assure. Hence, issues surrounding environmental accounting takes a lot of energy and efforts from both parties to work in utmost good faith.

6.3. Traditional Accounting Framework Paradigm

In addition to the accounting conceptual issues raised above, financial accounting concepts of materiality are relevant and important to the drafting of the sustainability accounting framework. Although EMA researchers argue (for example, Deegan, 2013) that the materiality principle determination process is a bit flawed, mainly because it cannot determine the extent to which a disclosure is sustainable, materiality remains an important aspect of environmental management accounting. Deegan, (2013) argues that adding the 'debits and credits' within a traditional accounting framework does not constitute environmental accounting or green accounting. Financial accounting has many conventions that eliminate its ability to provide meaningful information or contributions to address social and environmental performance concerns which are associated with corporate conduct (debatable see for example, Bebbington & Gray, 2001; Gray, 2010; Schaltegger *et al*., 2013; Thornton, 2013). These conventions include the entity principle, the golden rules as well as the materiality concept. Laughlin (2007) criticised the double entry system as a root cause of accounting logic which is permeating into environmental management accounting. Deegan (2013) further, argues that if accountants cannot measure something it does not exist.

The financial Accounting framework by the IASB, on its own, provides obstacles which block accountants from engaging in any form of meaningful and holistic accounting. Therefore, financial accounting is not designed to include social and environmental impacts of organisations. It becomes very complicated to use accounting conventions in EMA which are complex in their own setting. The integration of the concepts into accounting should be dropped and a new system which accounts for environmental costs should be developed (Jones, 2010). Islam & Deegan (2008), emphasised that accountants need to be objective in handling environmental management accounting issues. This objectivity is usually seen in the narratives which accompany the financial report in reference to the social and environmental components thereby bringing out the whole idea of the integrated reports into perspective.

The International Integrated Reporting Council (IIRC) and the Global Reporting Initiatives (GRI) all borrow their concepts from financial accounting and, these include the materiality, measurement, and completeness reporting boundaries. This borrowing is a major challenge and hindrance in EMA (Bouten & Hoozee, 2015; Papaspyropoulos *et al.*, 2012). There is also a call for financial accounting to change to incorporate environmental issues in their systems Deegan (2013). The current study indicates that the reporting will be difficult but can be done, while other study participants indicated that if EMA comes as a standalone systems it poses major challenges in reporting. The practicing professionals are indecisive and need guidance as to whether traditional accounting should

incorporate EMA systems or should be a standalone system because of the technicalities which can be posed by both sides of implementing EMA.

6.4. EMA Implementation Process

The departure point in developing the current model framework is the approach by Bebbington & Gray, (2001). The authors point out the stages in developing a comprehensive framework which is more aligned to Zimbabwe and possibly other developing countries which are in the inception stages of EMA development. According to Bebbington & Gray (2001), there is, therefore, a great need to (i.) examine the environment, (ii.) identify environmental aspects within the environment, (iii). Assess the impact which arise, and (iv) consider the costs of remedy. Bebbington & Gray (2001) recommend the processes mentioned above as suitable for the mining sector because of the complexities in implementing EMA as an alternative to proposing different sections of environmental costs and revenues as given by IFAC (2005) which might not be compatible with companies in the extractive industries. Examining the environment within which the company is operating gives information peculiar to the company and once this is done, companies with similar components can be compared for standardisation purposes. Luther (1996) summed it all up and said, environmental impact (EI) accounting information issues are usually thorny, and difficult to understand, codify, as well as, to justify from a conceptual framework. There is need to come up with a rational conceptual framework for the mining sector and extractive industries.

This study proposes the stages methods, rather than prescribing the ones given by IFAC (2005), Jasch (2006), United Nations (2001b)for the companies in developed world. The stages method gives companies in the developing world flexibility to come up with their costs which are peculiar and avoids redundant systems which might not work. Hence, if the costs are the same then integration into a comprehensive framework is important which is all encompassing and catering for companies in different economies. The cost categories which were developed in the past frameworks had environmental categories which were not affecting companies in breweries industries and the mining industry. The costs which were not affecting these industries were hidden from the cost sheets. That is an indication that the framework can never be the same but the stages method towards cost category developments should allow companies to discover their environmental aspects on which to report. The current framework is not meant to be a solution to EMA implementation as companies may consult other frameworks for environmentally related costs and savings such as the ones given on Figures 6.2 and 6.3. The current study could not prescribe cost categories because observations were not done in this study as the researcher was not given the ledger account listings by mining companies due to privacy issues. The ledger account listings could have enabled the research to prescribe the

unique cost categories within the mining sector and extractive industries. The observations require a lot of time to be spent in the field observing processes and approval by different mining companies for the researcher to be involved in the day-to-day mining companies' processes for a considerable period of time so as to understand the relevant costs in the industry.

The stages will be discussed in reference to Zimbabwe in the next sections as given in Figure 6.1 below. They have modifications to be applicable in Zimbabwe's mining sector and extractive industries

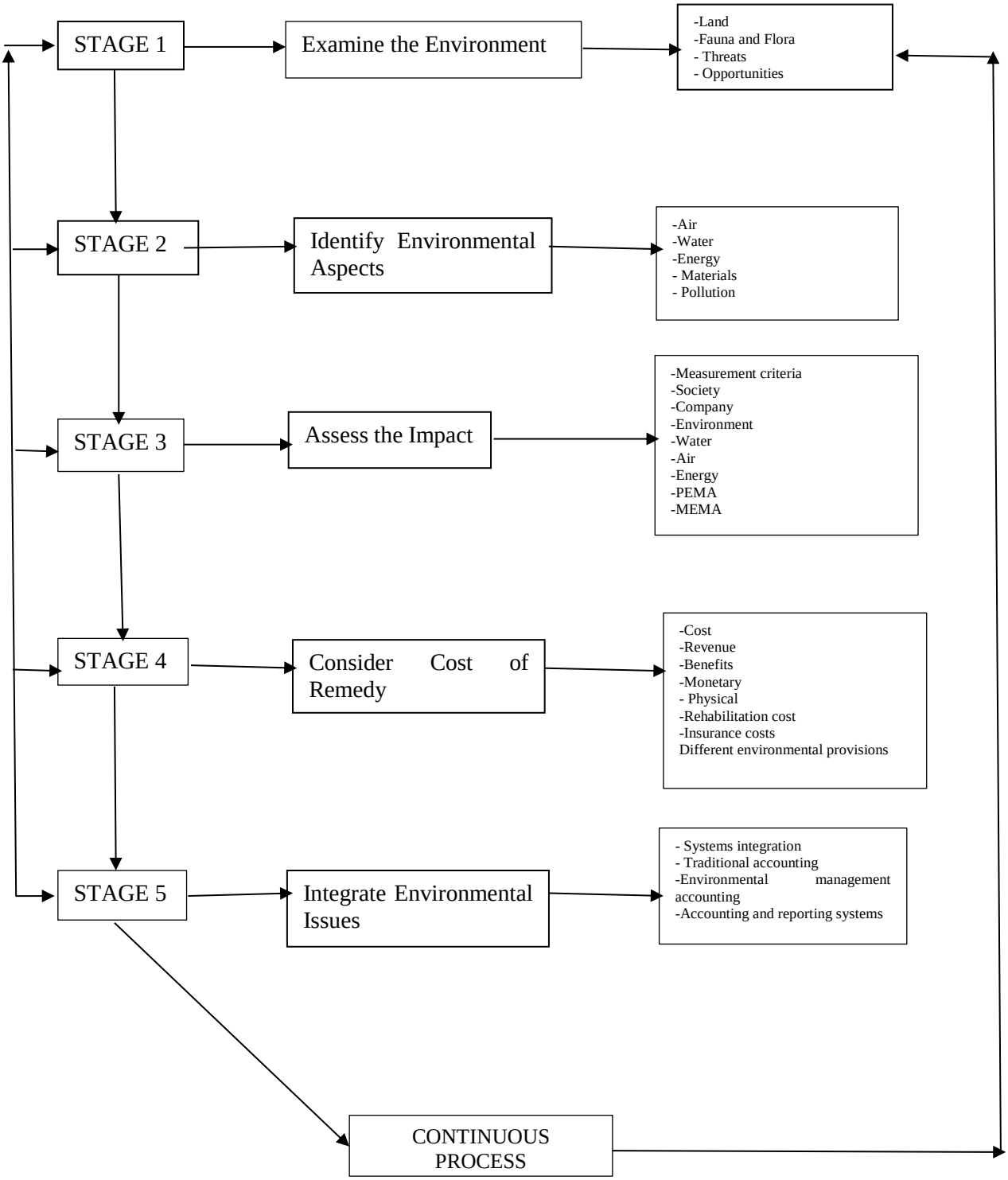

Figure 6.1 Proposed Model Framework of Environmental Management Accounting

Source: Author

6.4.1. Stage 1: Examining the environment

The first stage proposes that companies examine the environment within which the project is taking place in terms of the land, water, fauna, flora and human elements (Bebbington & Gray, 2001). The process of examining the environment should follow after the environmental impact assessments which were pointed out in literature as mandatory in many countries (see for example, Mtisi *et al*., 2011). Examining the environment with a perspective of accounting, for both the environmental internalities and externalities, helps as part of the physical examination of the entity. The examination of the environment helps in tabulating the first parameters of accounting for environmental impacts. This includes issues to do with how the land, water, fauna, flora and human elements are affected and at the same time how they affect the operations of the company with an aim of feeding into the monetary aspects of the accounting systems being informed by the physical processes. At the onset of this stage, the physical environmental management accounting starts to build with an intention of feeding into the monetary side of EMA. The companies have to do the environmental assessments before implementing EMA or developing an EMA system as, this helps in coming up with a company specific system which addresses the environmental issues that exist in a particular company. The environmental assessment requires experts who are able to do a physical examination of the environment, and establish the extent of environmental impacts the company will exert on the natural land. The issues to do with the accounting entity principle and accounting for natural land come into play at this stage. The company has to make a distinction on items affected, that is, the ones they can account for and those they cannot account for (usually these are externalities). Questions will be paused on what should be done with companies which have been operating without the system. The help of the EIA's will be solicited to assess how the environment was before the operations started and build up from there to gain knowledge on the company's impact on the environment. Retrospective application of accounting principles has always paused challenges which need to be solved in today's EMA. The assessors have to agree on reasonable grounds to operate and place a value on the environment.

6.4.2. Stage 2: Identifying the environmental aspects.

The stage preceding the first one requires companies to identify the environmental aspects within the environment. This includes listing all the peculiar environmental aspects which have an ability to change over time or to cause harm to the ecosystem, livelihoods, fauna and flora. This stage is

important because it is the deciding stage of EMA implementation. It is apparent that not all environmental issues will be identified because some of the environmental aspects will be identified in the long run as the company operates and they will have to be included in the process as the company continues with its activities. The identification of the environmental aspects does not only mean the aspects which can be picked before operations, but the aspects within the operating environment of the company such as water, energy, air, pollution and all sorts of waste management. This stage requires the measurement criteria and the determination of the minimum amount of disposal which can be acceptable by the management thereof. The stage also encompasses the inclusion of sustainable cost calculations (SCC) which have to be based on the existing international standards. If the standards are not established for any identified environmental issue, the company has to make efforts over time to establish these standards based on operations. The idea is to reduce the impact of environmental issues to a containable level, thereby helping in achieving sustainability in the sector. The second stage is done before and after the company starts operating. The environmental issues include the issues that are both external and internal to the company. The external issues help in reducing externalities after companies stop operating and in finding ways of mitigating them before they cause a high level of unaccountable harm to the environment and its habitats.

Prior studies by Burritt et al (2002) posit that many companies are poorly positioned for collection of monetary data relevant to EMA which requires experts, in physical environmental management accounting, who are knowledgeable with flow process accounting techniques. Many companies usually hire experts to identify and collect relevant EMA data for inclusion in EMA systems. The environmental aspects are not always visible at first as they require attention to detail and collaboration among EMA players as indicated in literature and results of the study (see sections 2.6.3 and 5.8.2)

6.4.3. Stage 3: Assess the impacts of aspects in stage 2

Stage three is crucial in assessing the impacts which arise from environmental aspects identified in Stage 2. The environmental aspect's impacts should be material enough to change the sustainability of the environment and the company. They should be in a position to affect the company and surroundings both positively and negatively. The environmentalists indicate that every environmental aspect is very important, but from an accounting point of view the materiality and measurement concept comes into play. This stage brings about the need for incorporating both MEMA and PEMA aspects because the information needs in EMA tools vary with the users. The impacts should be measurable and material enough. Materiality is determined by the company which set materiality

criteria. Measuring impact is a technical issue which requires either experts or following international guidelines. It is important for companies in Zimbabwe to determine reporting areas which are crucial in environmental management accounting for furthering accounting sustainability issues. Impact categories should not only include negative impacts but also positive impacts. The profitable environmental issues should be identified and their possible revenues over time determined. Likewise the negative impacts and their costs should be identified and tabulated. It is inappropriate at this stage to stipulate the possible costs to be included since the operations of the extractive industries are unique and their environmental impacts are different. Companies should be given an opportunity to list their own costs and in the long run, after many companies identify their specific environmental costs, broad categories will be streamlined to come up with a standard for the whole sector. This process might take time to accomplish and few steps towards standardisation make a difference.

Two main groups of environmental impacts related to company activities need to be considered. The first group includes environment impacts on the economic situation of the company. This category is often expressed in monetary environmental information, for example, expenditure in cleaner production, fines, and value of environmental assets. It is broadly based on conventional management accounting information. The second group are company impacts on environmental systems. This category is reflected in physical information. The company should incorporate past, present, futures, materials and energy amounts that have had any impacts on ecological systems. The physical environmental information is represented in physical units such as kilograms, joules of energy, and tons.

6.4.4. Stage 4: Consider the cost of remedying impacts in stage 3

The fourth stage considers the cost of remedying the impacts. This framework proposed the identification of all possible cost which can be incurred in efforts to reduce the impacts identified in stage 3. It is imperative to note that the current research proposes, in addition, the costs of considering the benefits. EMA's idea according to the United Nations (2001b) is to help decision makers realised the potential benefits of implementing EMA on a day-to-day basis. The costs of considering the benefits which can be harvested out of possible environmental impacts can be a good driving force and motivator to companies for implementation of EMA systems as opposed to punitive measures. Environmental investments should act as an attractive measure to the implementation of EMA. The companies are realising benefits of compliance with environmental regulation which characterises Zimbabwe's EMA applications in the form of avoiding heavy penalties. Burritt *et al.,* (2002) Indicated that the costs of environmental impacts in the form of penalties have risen substantially in developing countries. This is also true of Zimbabwe which is heavily regularised with punitive

measures which compel companies to comply with environmental regulations. The other benefits which emanate from environmental practices are welcome and act as motivators for implementing EMA. Companies in the past were not implementing EMA because of the envisaged heavy capital investments in EMA implementation. EMA should not be seen as a regulatory punitive, but also as a sustainable avenue for making more money in the sector. It encourages a win-win situation for stakeholders in both mining and extractive industries of Zimbabwe.

The possible costs of remedy which have been indicated in the data include the environmental rehabilitation costs, different compliance costs, provisions set aside by companies through government engagements, insurance costs against all possible future liabilities, community social costs like the community trust share ownership schemes, and the infrastructure developments costs together with the corporate social responsibility costs (see section 5.4 and 5.8.5). Companies may identify other costs peculiar to their operations which are not generic as the ones given above. The positive thing about this framework is that it gives companies the flexibility to identify their own unique costs and report on them.

6.4.5. Stage 5: Integrating the environmental issues in the accounting and reporting systems of the company.

The stage 5 is motivated by information obtained in this study and has not been proposed before. The researcher recommends the integration process in line with the King IV report recommendations of application (KING IV, 2016). The integration requires that all the information obtained in the preceding stages be put into practice and reduced into day-to-day business decision making process of the companies. This includes listing the possible environmental impact cost and benefits in the ledger accounts of the company and periodically recording transactions in line with the laid down processes. At the end of the reporting period, a cost sheet should be drawn out of the company system which looks familiar to the one shared in Chapter 2, Figure 2.4 and Figure 2.5 of literature developed by IFAC, (2005). This cost statement should be accompanied by a narrative report which helps the internal and external stakeholders understand the environmental initiatives.

The externalities which companies are aware of should be disclosed with supporting possible mitigation measures. Jasch, (2006) commended that externalities are estimated by, for example, the costs caused to society for clean-up and treatment; lost income to other groups, for example, from fisheries and farming; the health costs due to contamination; and the loss value of property. The ability to identify these externalities makes the decision makers ponder about them and keep looking for solutions. It also enables the companies to be accountable to the stakeholders who are affected by the operations of the company. However, some authors (See for example, Deegan, 2013; Gray, 2013;

Jones, 2010; Thornton, 2013) argue that transparency of that level can come as a threat to the existence of the company and some rational in disclosure of the externalities need to be exercised to strike a balance between survival and saving the interests of the companies. According to the green accounting rules, investors are not willing to invest in companies with high externalities. This brings about the issue of environmental information disclosure which attracts green investors. This is debatable and need further consideration in future research. The integration process can be cumbersome for the first time as companies might need to hire experts in the integration process or equip their staff with the required expertise for easy implementation and further development. The accounting profession should also consider equipping accountants with information to carry out the integration process in the mining and extractive industry. In most cases, accountants end up doing the process on behalf of companies because they are the custodians of the environmental information.

The EMA implementation process as envisaged by this study should be a continuous process because after reaching stage five the process should continue again from stage one, scanning the environment for possible environmental issues which will not have been taken into consideration, and considering them through to the last stage. This is done to perfect the implementation process.

The next sections of the framework assess the important environmental management accounting tools. The framework links business actors and environmental management accounting (EMA) tools as proposed by Burritt *et al* (2002) in their proposed comprehensive framework as given on Figure 6.2 below. The current framework can be used in line with other frameworks proposed by Burritt *et al* (2002) and Jones (2010) given on Figures 6.2 and 6.3 respectively. The current framework should take into consideration information focus (that is short term focus or long-term focus), the users of the information and whether EMA information is for future orientation or past orientation. This should be done striking a balance between the need to reduce environmental damage through to environmental disclosure in environmental reports produced under the sustainability accounting framework. Doing this ensures the link of the current framework with the other frameworks given in Figure 6.2 and Figure 6.3.

Environmental Management Accounting (EMA)					
		Monetary Environmental Management Accounting (MEMA)		Physical Environmental Management Accounting (PEMA)	
		Short Term Focus	Long Term Focus	Short Term Focus	Long Term Focus
Past Orientation	Routinely generated information	1.Environmental cost accounting (eg variable costing, absorption costing, and activity based costing)	2.Environmentally induced capital expenditure and revenues	9. Material and energy flow accounting (short term impacts on the environment –product, site ,division and company levels)	10. Environmental (or natural) capital impact accounting
	Ad hoc Information	3.Ex post assessment of relevant environmental costing decisions	4.Environmental life cycle (and target) costing Post investment assessment of individual projects	11. Ex post assessment of short term environmental impacts (eg of a site product)	12. Life cycle inventories Post investment assessment of physical environmental investment appraisal
Future Orientation	Routinely generated information	5.Monetary environmental operational budgeting (flows) Monetary environmental capital budgeting (stocks)	6.Environmental long term financial planning	13. Physical environmental budgeting (flows and stocks) (eg. material and energy flow activity based budgeting)	14. Long term physical environmental planning
	Ad hoc Information	7.Relevant environmental costing (eg. Special orders, product mix with capacity constraint)	8.Monetary environmental project investment appraisal Environmental life cycle budgeting and target pricing	15. Relevant environmental impacts (eg given short run constraints on activities)	16. Physical environmental investment appraisal Life cycle analysis of special project

Figure 6.2 Proposed Comprehensive Framework of Environmental Management Accounting

Source: Burritt, Han & Schaltegger (2002)

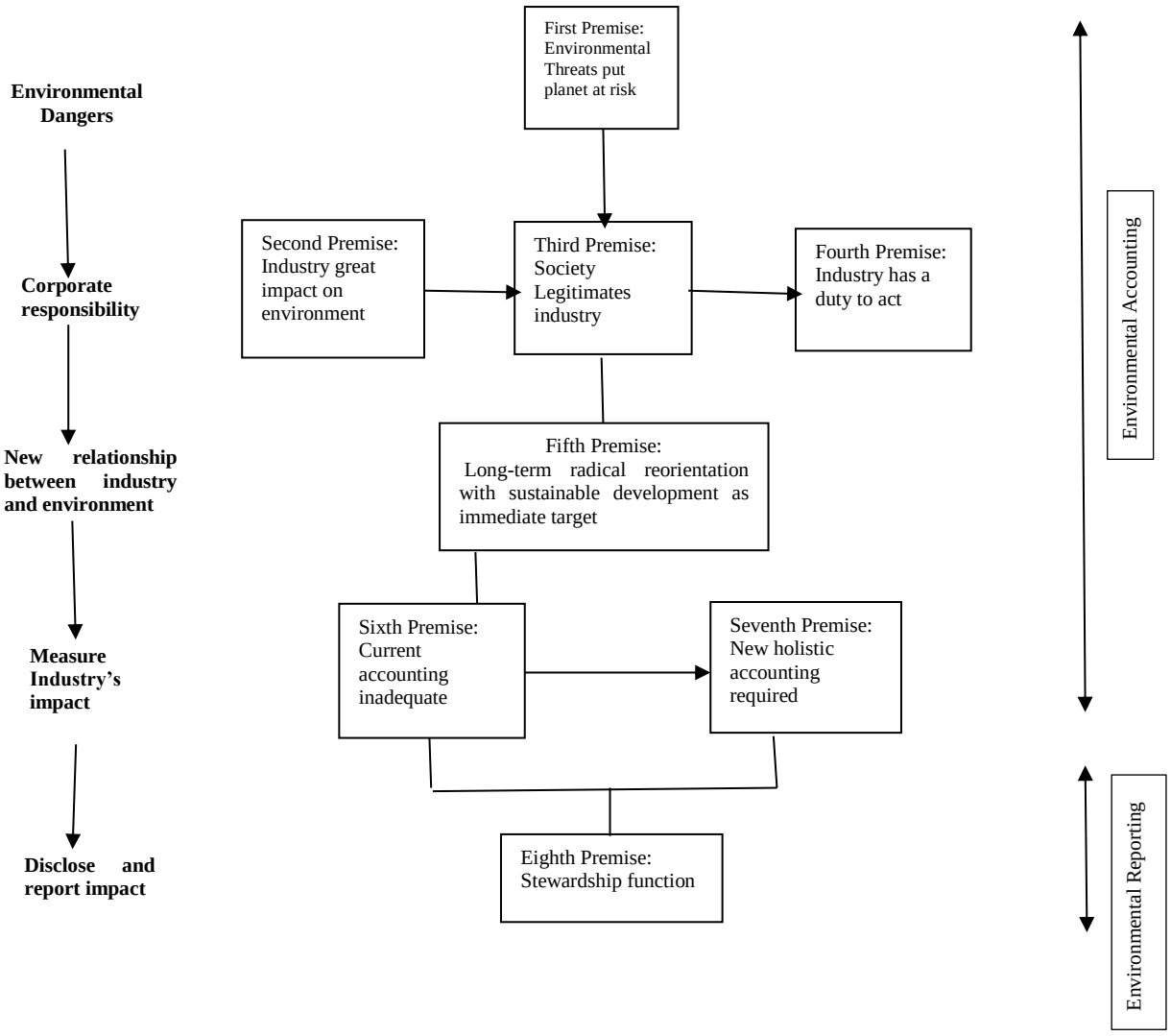

Figure 6.3 A possible theoretical model for environmental accounting and reporting

Source: Jones (2010)

Accounting for extractive industries has been a contested issue for decades as a result of different costing methods available, and EMA adds more contestations to this decade long debate (Cortese., *et al* 2009). The traditional accounting paradigm in extractive accounting was criticised by (Jones, 2010) as he discusses why it is important to develop a comprehensive system of environmental accounting. The departure point was that companies should behave in a socially acceptable way. Jones (2010) provides a theoretical model with eight premises and consists of five major parts which are: environmental dangers; corporate responsibility; a new relationship between industry and environment; a need to measure this impact; and a need to report this impact (See Figure 6.3 above). There is no universally accepted theoretical framework of corporate social accounting (Jones, 2010). Jones (2010) further argues that conventional accounting is not suitable for environmental accounting and reporting and we need to develop a new system of environmental accounting (see also sections 1.10.8 and 2.3 for detailed discussion). This is because of the capitalist orientation, business focus,

reliance on neoclassical economics, numerical quantification, monetary dependence and technical accounting practice. New systems and approaches are needed to capture and measure the environmental impacts, hence, the current framework proposed in Figure 6.1. Jones (2010), further argues that there are very large negative environmental impacts which generate large economic and socially positive benefits.

It is important for EMA implementers to consider in great depth the issues raised in the two frameworks given above in collaboration with the framework given in Figure 6.1.

6.5. Environmental Management Accounting Tools

Environmental Management accounting emphasises the need to define EMA from two fundamental approaches or angles, one from the internal environmental accounting using monetary measure and the other from monetary and non-monetary approaches to internal accounting. Two major concepts of EMA, MEMA and PEMA, should systematically integrate as core constructs in EMA as shown in Figure 6.2 above. Management accounting information is designed to satisfy the needs of managers seeking information about economic performance of a company as a basis for decision making. The information should be useful to internal and external stakeholders when it comes to financial accounting.

EMA tools encourage the focus on the information for internal management purposes rather than external purposes. Information for external purposes is referred to as financial management accounting in some instances, but the promoters of EMA often refer to both internal and external information as EMA, hence, the need for terminology standardisation. The focus on the external reporting can distort the collection and use of information for decision making.

EMA also consists of two fundamental information systems which are Material Flow Accounting (MFA) and Environmental Cost Accounting (ECA). The fundamental information systems provide a basis for other EMA tools like Investment Appraisal, Budgeting and Life cycle assessment and calculating costs and savings (Jasch, 2006b). Jasch (2006) explains that it is not the goal of EMA to highlight that environmental protection is expensive, but rather to highlight the scope of savings potentials. The author indicated that it is not important to point out which cost are environmental or not, or what percentage of something is environmental or not because that is always difficult to determine as there are some costs which cannot be determined precisely. All relevant and significant costs should be considered in making decisions. In the externalities debate, it is important to note that EMA does not typically calculate ‘external’ costs for which the organisation is not legally held responsible. Though this is debatable, most EMA costs are included in external reporting with few

modifications to help in the disclosure of environmental activities. More importantly, environmental information helps management to take decisions which improve environmental performance.

6.6. EMA Systems Dimensions

Environmental management accounting system dimensions should be given a considerable amount of thought. The company should think of all the aspects which the EMA system should be able to address. These aspect includes whether the system is used for decision making purposes or for internal or external reporting purposes. The users of the information are important since they require different sets of information in order to progress successfully in an EMA system. Some users require physical information while others require monetary information as given by Burritt *et al.,* (2002: 45–46)'s corporate EMA users, their basic goals and the relevant EMA tools. The systems should indicate whether the information is needed for long term planning or short term planning by highlighting the system focus. Management should also consider whether the information is needed for routine purposes or *ad hoc* purposes. It is important also to consider whether the system is needed for future purposes, that is, future orientation or for historical purposes, that is, past orientation. Consideration of all these aspects ensures that a comprehensive system is developed. This is in line with the recommendations of Burritt *et al.,* (2002)'s proposed comprehensive framework as given in Figure 6.2 above.

Management has to provide parameters for different information requirements and make a decision from the beginning, that is, whether the EMA system information needs will save internal stakeholders or external stakeholders in the short term or long term or not. There are different users of EMA information as stated by Bebbington & Gray, (2001). These different types of information users need to be considered in EMA issues and how they tend to use the information. The consideration helps in coming up with information that can be useful to all departments for decision making purposes. Hence, the need for PEMA and MEMA information should be aligned towards specific departments in line with their goals and information desires to improve environmental performance. It is apparent that that there are departments which are not able to use the other set of information, hence, a distinction is needed to be able to save these different needs. Some functional departments require physical or monetary information while others require a combination of both. It is obvious that the accounting information cannot produce different sets of information for different users but they have to identify and strike a balance in order to serve both internal user departments within an organisation. Bebbington & Gray (2001:46-48).The aggregated information is important for decision making within EMA environment.

6.7. Summary and Deduction

The current chapter proposed a systematic stages method as the way forward for implementing EMA in Zimbabwe's extractive industries. This framework was adopted because of its proactive nature, which is not prescriptive to the mining industry. The framework will act as a starting point for EMA initiative, since there has not been any framework developed for the extractive industry and mining sector of Zimbabwe. The framework will need to be refined to consider other aspects to make it specific and come up with cost categories. The positive about this framework is that it is flexible enough to allow companies to develop the EMA system which caters for the specific environmental costs which they can control and further develop. The framework requires a dedicated team of experts from all fields for it to work properly. It also requires management support and other external stakeholders support.

CHAPTER 7
FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

7.0. Introduction

This chapter provides key findings and contributions of this study. The aim of the research was to understand the relevance of Environmental Management Accounting in Zimbabwe's extractive industries and mining sector, motivated by the paucity of literature in the mining sector as explained by the International Federation of Accountants (IFAC). Globally the mining sector and extractive industries pose a heavy challenge in EMA development and has resulted in the area not receiving considerable attention, evidenced by the lack of EMA framework in the mining sector. This gap was identified in the literature and the researcher endeavoured to fill it. Specifically, this research sought to understand how EMA contributes to sustainable mining development through the development of appropriate EMA systems. The researcher examined the impact and contributions of EMA systems to the mining sector.

The focus of this study was to develop an EMA model framework for the Zimbabwe mining sector which can be replicated for the mining sector in other developing countries. The research thus act as exploratory work for further EMA research in Zimbabwe and contributes to literature development in developing countries.

The study also sought to explore how the government of Zimbabwe regulates the mining companies, and to explore how EMA can promote sustainability better than traditional accounting. It was concluded that the mining sector of Zimbabwe is highly regulated through a plethora of government regulations which in most cases are regulatory requirements for obtaining operational licences in the sector. There is a substantive body of evidence in the literature reviewed and in the mining sector of Zimbabwe that shows that EMA contributes to sustainability better than traditional accounting. However, it is also clear that in the long run, EMA should be treated as a standalone system in the mining sector.

This chapter provides a summary of the whole dissertation in the first section. Section 7.2 gives the research findings in line with the research objectives and questions raised in chapter one. Conclusions and key contributions of the research are given in section 7.3 and 7.4 respectively. The research weaknesses are articulated in section 7.5. Recommendations and future direction of research are given in sections 7.6 and 7.7. The chapter closes by giving a summary of the chapter.

7.1. Summary of the Dissertation

This section presents the summary of the whole study. Chapter 1 introduced the research topic and provides a discussion on the motivation for undertaking the study. The researcher pointed out that, although much work has been done in EMA in developed countries, the concept of EMA in developing countries and Zimbabwe is in its infancy, evidenced by the amount of published work in the area of EMA in developing countries. The contribution of Environmental Management Accounting to sustainability is arguably not questionable. From the definition itself, EMA points to two pillars of sustainable development, namely the environmental pillar and the economic pillar (subtly together with the social pillar).

The researcher argued that there is a need to develop an understanding of what EMA entails in order to avoid confusion, hence adopting the United Nations definition for this research. The researcher then analysed the differences in EMA definitions as given by different scholars. This helped in focusing on the appropriate definition for this study and outlining the shortcomings of other definitions which were not adopted for this research but which are also useful in having a comprehensive approach and understanding to EMA. The analysis of the definitions allowed the researcher to openly discuss the broad nature of the concept of EMA and how differently it is interpreted in different sectors of the economy.

The main research question addressed in the study was how EMA promotes sustainable development in the mining sector better than traditional accounting. The study explores how the government regulates the mining sector, the significance of EMA in the mining sector and how EMA can be implemented in the mining sector with a view to develop a model framework for EMA in Zimbabwe's mining sector. The International Federation of Accountants (IFAC) guiding document was used as an EMA framework in this research together with the EMA framework developed by Burritt *et al*., (2002) which indicates that EMA contributes to sustainability and the benefits brought by EMA outweigh the costs thereof. The frameworks indicate that EMA systems are relevant to sustainable development and hence in other sectors they call EMA 'sustainability accounting'.

The literature review in chapter 2 under the theme Environmental Management Accounting perspectives, highlighted the literature gaps which this research attempted to fill. The concept of Environmental Management Accounting which was examined as a new environmental management accounting tool kit was discussed. This consisted of defining EMA in line with the understanding of other scholars and professionals in the field of study. It was noted that EMA is widely defined and narrowed down to the three pillars of sustainability which include the social pillar. Other scholars argued that accounting did not have a place in environmental issues as it reduces it down to the debits

and credits of EMA which are not developed to cater for externalities using the capital acquisition concept (Golden rule). They assert that Accountants can only account for transactions within their control, not externalities. In Zimbabwe, there is no evidence of EMA development, except that Zimbabwe was part of the expert working group through UNEP in the round table for EMA development. This presents a big gap which needs to be addressed, considering the developments in mining with substantial unsustainable practices with the potential to contribute to the Zimbabwean economy.

The lack of EMA literature in Zimbabwe is evidence that the contributions brought about by EMA cannot be accounted for in Zimbabwe, hence the need to consider the modalities of developing and implementing EMA systems in the Zimbabwe mining sector and extractive industries. The contribution of EMA to sustainability was explored and the literature shows that while EMA contributes to sustainability the role of accountants in sustainability issues is not clear. In some instances, scholars call accountants gatekeepers and equate the accounting profession to people seeking relevance. It remains unclear throughout the literature reviewed how EMA contributes specifically towards sustainability in the mining sector.

In terms of environmental consciousness and reducing environmental impacts, and increasing company environmental performance; EMA has helped companies reach environmental performance targets by reducing costs and maximising benefits. There is a lot of empirical evidence which shows the significance of EMA in companies that recorded profits after implementing EMA. It is therefore, argued in the literature that EMA implementation is expensive and capital intensive but the cost of implementing EMA outweigh the benefits. Thus, EMA has not received considerable attention in developed countries because of its envisaged capital-intensive costs which are out of the reach of many developing countries. There is, however, an irony there, as most companies which operate in developing countries are conglomerates or subsidiaries to huge multinational companies which take advantage of the lack of environmental regulations in developing countries to exploit resources without environmental accountability. This has been clear in Zimbabwe with its Mines and Minerals Act which is aligned towards resource extraction not sustainable extraction. Institutional theories were assessed for the possible reasons for adopting EMA systems and implementing them. It was argued that the nature of the mining industry compelled many companies to implement EMA. Exploring these institutional theories (coercive, cognitive and normative institutional theories) helped the researcher understand the developments in the implementation of EMA and to identify issues that could be of interest to this study. The challenges of implementing EMA were explored together with the possible costs and benefits. The major challenges were mainly in the lack of knowledge of the area which the accounting professionals indicated as inherent in the guiding accounting standards

whereas the practitioners in the field indicated lack of such knowledge. Other challenges related to the traditional accounting systems hiding environmental costs in overheads, accounting systems challenges, poor communication links between accounting personnel and other departments and the inadequacy of the accounting system to track information concerning material use, flow and financing.

The researcher continued with the literature review in chapter 3 under the EMA regulatory framework theme to fill the research gap which covers how EMA is regulated in Zimbabwe. The chapter starts by providing a brief historic background of Zimbabwe's mining industry which has more than 60 different types of minerals, 40 of which have been exploited at one point or another. The Ministry of Mines and Mining development oversees the operations of the mining sector together with the Chamber of Mines of Zimbabwe (COMZ) which was established by an act of parliament. Zimbabwe currently depends on the mining sector for economic growth as the sector is out-performing other sectors in terms of contribution to the GDP of the country (Government of Zimbabwe, 2017:150). Environmental aspects and protection in the country are regulated by the Environmental Management Agency of Zimbabwe (EMAZ) which is a statutory board responsible for ensuring sustainable management of natural resources and protection of the environment in Zimbabwe. This board works hand in glove with the Ministry of Environment, Water and Climate. These departments and ministries should be the ones to spearhead the implementation of Environmental Management Accounting in Zimbabwe with the help of the United Nations Environmental Protection agency using the IFAC framework and the United Nations framework on EMA implementation.

The mining sector is heavily regulated (with over fifteen ACTS) and among those regulations, there are no regulations which relate to Environmental Management Accounting, an indication that EMA is not regulated at all in Zimbabwe and companies implement EMA as part of their corporate social responsibility. It was clear from the literature that there are no government accounting regulations relating to EMA except the traditional accounting regulations which govern the accounting profession adopted from the International Financial Reporting Standards Board (IFRSB) and the Generally Accepted Accounting Practices (GAAP). The mining sector consists of over 89 mining companies and is heavily regulated by the Mines and Minerals Act among other acts. The act has been criticized for being old and aligned towards resources extraction more than the sustainability thereof. There is a gap in the literature, partly presented throughout all acts and statutes which govern the mining sector, which do not mention Environmental Management Accounting, as an accountability mechanism to help reduce environmental impacts and harness environmental benefits through good environmental practices. The chapter concluded by looking at the importance of EMA in different sectors of the economy.

Chapter 4 covered the research methodology which explored various options which could potentially be employed for the execution of this study. The justification for selecting specific research paradigms and approaches in this study was provided. After reviewing Environmental Management Accounting methodology literature, the researcher observed that EMA follows a transdisciplinary approach to research, evident in the issues involving the environment, accounting and sustainability. The transdisciplinary approach helps in solving complex and interconnected problems of the world. The development and implementation of EMA was described in the literature as a complex and interconnected issue, hence the transdisciplinary approach was selected. Most previous research studies in EMA used the qualitative research design in the form of a literature review to understand the contribution of EMA to the body of knowledge and its relevance in the 21st century. The researcher noted that few studies were conducted in the field with practitioners through face-to-face interviews, questionnaires and observations. The observations were not successful due to the closed nature of the mining sector of Zimbabwe; however, the researcher managed to distribute questionnaires to participants and conducted interviews gaining first-hand information from participants in their natural setting. The data obtained was triangulated with the secondary data in the form of financial reports and sustainability reports. This helped the research to have an overall understanding of what is happening in as far as EMA implementation is concerned in the Zimbabwe mining sector and extractive industries.

Philosophical assumptions were used to gain understanding of the world the participants operate in. Participants' responses represent a world where EMA is being practiced though some of the participants were not aware of the existence of the phenomenon they were involved in. Understanding of these distinct worlds enabled the researcher to approach field work with an open mind not having assumptions which could hinder the collection of relevant field data for analysis. The researcher proceeded to understand EMA from the participants' view of their own world. The study used the ontological assumption to understand the nature of reality of EMA. The researcher understood what constitutes EMA knowledge through the epistemological paradigm. The positivist paradigm as well as the realism and interpretivist paradigms to research were considered in this study.

In brief the research adopted a qualitative research paradigm together with an interpretivist philosophy to understand Environmental Management Accounting in the mining sector. The interpretivist approach helped the researcher to understand EMA by gathering data from the practitioners through interviews and questionnaires from the perspectives of those involved. A single embedded case study approach was adopted with the mining sector as a case study with single cases of 89 mining companies. The findings were used to complement findings from secondary data which was in the form of sustainability reports and financial reports. The last section of the research

methodology chapter presented a detailed discussion of the research design, sampling and methods, data collection and analysis. It also included data validity and reliability as well as ethical considerations.

Zimbabwe's mining sector perspectives on EMA were given in chapter 5 which is the presentation of data, analysis and discussion of the survey data collected through questionnaires, interviews and secondary data in the form of sustainability reports and financial reports. The research questions formulated in chapter 1 were addressed thematically. Descriptions and interpretations were used to analyse survey data which was collected from 34 mining companies. “Atlas.ti” qualitative data analysis software was used to analyse data, by coding them and formulate themes which were used as the basis for discussion. The analysis of the results provided answers to the research questions outlined in chapter 1, helping the researcher achieve the research objectives set out in the same chapter. The last part of chapter 5 concluded that the development of an Environmental Management Accounting framework could have been more focused and prescriptive if mining houses had permitted observations to be conducted. However, the framework was developed in chapter six based on the data gathered from the field work and literature of the frameworks in other developing countries as well as developed countries to a lesser extent. The model EMA framework can be used to develop and implement EMA in the mining sector of Zimbabwe together with other international guiding documents. The framework is not prescriptive in nature but proactive giving mining companies the flexibility to come up with their own specific reporting requirements. The companies will follow the stages method which allows them to identify their own peculiar costs and revenue streams in the process.

7.2. Research Findings

The paucity of literature in EMA is only limited to developing countries. In developed countries EMA is now a common phenomenon, which is proving to be profitable to big companies. Importantly, although much has been documented about EMA, very little is known about how it is being implemented in Zimbabwe extractive Industries and the mining sector. Research from Europe, America, Asia and Africa has shown that EMA is taking centre stage in sustainable development issues but little is being done to standardise EMA and regulate it just like the accounting profession is being regulated. In Zimbabwe extractive industries and mining sector EMA was acknowledged by IFAC (2005) as contributing positively to sustainability issues although appropriate supporting mechanisms have yet to be put in place to support EMA initiative. Thus, companies are at liberty to implement EMA and call it by different names, most of which are aligned towards corporate social responsibility and environmental management without the commensurate accounting system to

support it. Literature (refer to section 2.3.3) has criticized the role of accountants in Environmental Management Accounting and the role of EMA in sustainability accounting. Accountants have been criticized for seeking relevance in areas in which they do not have expertise and for their role as being gatekeepers between sustainability managers and the professionals involved in sustainability issues like environmentalists and the concerned stakeholders. Environmental Management Accounting has also been criticized for not playing any role in sustainable development. Scholars have stated that environmental issues do not play a central role, especially when spearheaded by accountants, and will probably not play a central role in serving the planet earth (Deegan, 2013). The issues revolve along the inability of accountants to account for externalities, but also for issues within their control as shown by the entity principle of accounting. The entity principle follows the golden rule that the equation of accounting, capital should equal assets and liabilities. The organisation should only account for activities within its control, hence accounting for externalities is foreign within the accounting framework. Environmental Management Accounting is more concerned with the internal environmental aspects within the control of the entity. The inability of EMA to cater for externalities renders it not appropriate to contribute towards sustainability.

With the above background the researcher assessed the relevance of Environmental Management Accounting in Zimbabwe's extractive industries and mining sector. To do this the researcher first explored how EMA promotes sustainability in general. The researcher concurred that sustainability accounting has a role in promoting sustainable development by contributing towards the three sustainability indicators which are the economic, social and environmental indicators. The mining companies were used as a unit of analysis for the survey data in the form of questionnaires and interviews as well as secondary data in the form of sustainability reports and financial reports. The mining sector comprised of over 89 mining companies. Using the qualitative data obtained in the mining sector of Zimbabwe and analysed using "Atlas.ti" qualitative data analysis software. The study found evidence that the concept of sustainability accounting or Environmental Management Accounting contributes positively towards sustainable development in the mining sector. The concept ensures that the extractive industries and mining sector of Zimbabwe are sustainable. Although the mining sector on its own is unsustainable in nature, EMA move towards ensuring that the future generations benefit from the same resources and the land remains habitable after resource extraction as a sustainable indicator are worthwhile. Evidence from field work, through the lens of the practitioners, reveals that EMA points towards the sustainability direction of the mining sector if correctly implemented. They also submit that there are more benefits to be harvested than the costs incurred in setting EMA up. Though, EMA contributes towards sustainability, it was discovered that many companies were reluctant to implement fully-fledged EMA because of its envisaged capital

intensive nature. EMA was being implemented subconsciously as a corporate social responsibility endeavour of many organisations without the idea of harvesting profits or benefits out of it and was mainly considered under compliance-related organisation issues which are regulatory in nature. The reason for the subconscious implementation of EMA was because of lack of awareness of the subject matter through government policies, as there is no policy or regulation aligned towards accounting for environmental impacts in monetary and physical terms. The one practice close to government policy direction on implementation of environmental accounting is the requirement to follow Environmental Impact Assessments before the operationalisation of the mining sector company activities. The recommendations from the United Nations on the round table for Environmental Management Accounting of 2001 were not followed to develop sector-specific policies on Environmental Management Accounting in Zimbabwe. There is no record, to the researcher's knowledge, and field work conducted on any policy developed by the government to direct/guide Environmental Management Accounting. Evidence from the mining sector indicated that although EMA was being implemented subconsciously, there is no evidence of any framework/standards/regulations which were being followed on EMA in Zimbabwe's mining sector. The concept, after being introduced and correctly defined by the practitioners from their general knowledge of sustainability accounting and interactions with the researcher indicated the need for EMA and its envisaged contributions to sustainability in the mining sector and extractive industries of Zimbabwe.

Furthermore, it was noted that EMA promotes sustainability in the mining sector better than traditional accounting. This was revealed from the field work and supported by extant literature. EMA uncovers the hidden overhead costs and enable the allocation of costs to processes and appropriate departments, unlike traditional accounting which hides the environmental costs in overheads, thus, making the costing of processes and end products very difficult. Through EMA, all the environment-related costs are availed, and costs are bundled from the processes generating costs. Traditional accounting is not fully developed to cater for environmental impacts separately in sectors where environmental performance is critical to the survival of the organisation.

To promote sustainability, the government of Zimbabwe should support with the development of regulations and standards which relate to sustainability accounting. There are currently no regulations or standards which are being followed in regulating the mining sector of Zimbabwe in as far as EMA is concerned. The regulations which are available are those which are in line with environmental management in general which are enforced by the Environmental Management Agency of Zimbabwe (EMAZ). The lack of government intervention in developing accounting-related policies in EMA implementations as expounded by the UN policies and linkages (United Nations, 2001a) is a clear

indication of lack of commitment towards the area of sustainability and no company can be held accountable to the issue if the government does not show the first steps of commitment.

Companies which are involved in implementing EMA are doing it to enhance their corporate image and to be able to gain access to globally competitive green markets of the world which are profitable and attracting green investors. Other mining companies were not promoting EMA initiatives although they were aware of them. That was mainly due to lack of knowledge on how they can develop systems which help them implement EMA. The other reasons are the general fear of the expensive nature of EMA technologies and systems, the ignorance of management towards the possible benefits of implementing EMA and the organisational innovations which it comes with. Being environmentally conscious through EMA systems help managers in aiding inclusive environmental decisions by tracking and tracing environmental costs.

The importance of EMA in the mining sector is enormous, including the access to the global competitive green markets, achievement of organisational innovation, the ability of organisations to make sound environmental decisions to minimise environmental costs and maximise environmental benefits while at the same time ensuring damage to the environment is kept at minimum (environmental negative impacts). EMA also made a positive contribution towards social aspects which were, according to the literature, not easy to account for in terms of the contribution of accounting systems to the effort. The social aspects of the stakeholders and communities around the mining areas were envisaged to improve through sustainability accounting, and costs relating to the social aspects could be accounted for through EMA. The significance of EMA cannot be under estimated in the mining sector and extractive industry since its envisaged contributions are long overdue. Survey data indicated that 75 percent of participants had EMA knowledge while 25 percent of participants did not know about EMA. That is contrary to the literature which indicated that many people were not aware of EMA in developed and developing countries. Having such a high number of participants in a developing country shows that the understanding and adoption of EMA concept is increasing. EMA was explained as consisting of Physical environmental management accounting (PEMA) which is concerned with the physical flow of resources and monetary environmental management accounting (MEMA) which is concerned with the accounting of environmental impacts in monetary terms to develop accounting data for decision making purposes.

Lastly, the research explored if Environmental Management Accounting was being implemented in Zimbabwe's mining sector and extractive industry. To do that participants were asked questions for evidence through interviews and questionnaires, and also through searching in the financial reports of companies in the mining sector of Zimbabwe. The implementation process involves the recording

of environmentally related transactions and determination of the items to be included in the environmentally differentiated statements and the frequency with which the statements could be produced for the decision making process. The researcher found out that EMA was being implemented in a piecemeal fashion with other companies not aware of it. Many companies were concerned with the recording of costs which relate to the environmental compliance costs and the regulatory costs in the form of fines and statutory environmental payments. The implementation of EMA is being done by 65 percent of companies who participated while 35 percent of companies were either not aware or not implementing EMA at all. The implementers were doing EMA under various and diverse names (refer to Figure 5.17 EMA reference terms). The major benefit of implementing EMA in Zimbabwe which is limited to the narrow understanding of EMA benefits is the avoidance of penalties and company closures through non-compliance with environmental requirements. This benefit is limited in scope because there are many more important and attractive benefits which can be brought about by EMA if the company is open to EMA initiatives in the long run, as it improves organisational innovativeness and opens avenues to new ways of thinking and articulating environmental performance beyond that which can be seen by companies outside EMA thinking. The compliance with environment regulatory requirements also reduces company liabilities and ensures that the company revenue base is not eroded which is a major benefit. It is important to mention that the financial reports and sustainability reports are indicative of the culture of taking care of compliance costs such as doing sustainability reporting and including the corporate social responsibility issues as part of the social and environmental accounting. The social costs and CSR costs characterise sustainability accounting reporting in Zimbabwe which is a limited scope of Environmental Management Accounting according to literature. There is clearly more to be done. Most respondents indicated that EMA is the ability to properly account for rehabilitation and mine closure costs in advance. The model framework for EMA in Zimbabwe mining sector is the first step towards the standardisation of EMA. This need to be refined/improved by doing observations of the accounting systems in the mining sector to develop a more comprehensive EMA framework for Zimbabwe.

7.3. Conclusions

Based on the findings in section 7.2, it is important to highlight in the conclusions that the statement of the problem cannot be more specific than it is. The issues to do with Environmental Management Accounting have not been openly discussed and are not known in Zimbabwe mining sector. The following sections will present the major conclusions from the dissertation based on the objectives set out in chapter 1 of this study.

7.3.1. Promotion of sustainability through EMA

It is concluded that in general EMA contributes towards the promotion of mining sustainability. The implementation of EMA or mere consideration of EMA initiatives or sustainability accounting is a strong indication of sustainability. EMA is considered as doing management accounting with a bias towards environmental considerations which improves environmental efficiency. EMA also points towards economic and social performance. The mining sector has been labelled throughout the literature as being unsustainable. It is, however, argued that the unsustainable nature is inherent in the mining sector but the avoidable unsustainable nature of mining practices is of concern. The avoidable unsustainable mining practices if taken care of are an indicator to mining sustainability; which includes reducing the environmental impacts at the same time as increasing environmental performance.

7.3.2. EMA/traditional accounting

Environmental Management Accounting and traditional accounting is clearly distinct from the research and literature**.** Environmental Management Accounting is about addressing environmental concerns for the ultimate economic benefits using accounting related systems while traditional accounting is governed by many conventions, rules, regulations and principles. EMA refers to sustainable accounting practices which address issues revolving around green accounting. The two paradigms can work together in addressing the needed adaptive accounting practices and cannot work in isolation of each other, though among the two practices no one accounting practice can take the role of the other, as revealed in literature that the traditional accounting practices do not take account of the environmental costs and have a tendency of hiding pertinent environmental costs which are important for making sound environmental decisions which reduce the environmental impacts and enhances the social and economic performance. The costs hidden in overheads are revealed through EMA and costing becomes easy. EMA uncovers environmental costs which cannot be easily identified through traditional accounting systems.

7.3.3. Regulation of the mining sector and extractive industries

The mining sector is heavily regulated with acts and other government legislation. In all these regulations, acts and statutes, there is no regulations which is specific to EMA in the Zimbabwe Mining sector. The companies are self-regulating as it relates to EMA implementation and they follow

the corporate social responsibility and the need to be recognised in the global lucrative green markets which are concerned about the environmental impacts of mining companies and the actions which are taken by companies to address those concerns. Companies are at liberty to implement EMA or not to, with a host of other environmental management regulations being enforced by the EMAZ. In Zimbabwe, mining companies regard EMA as an unnecessary expensive responsibility which strains the already shrinking resources. The implementation of EMA has a bearing on the profit-making ability of companies as it reduces the revenue base of the mining companies, hence other companies are pre-occupied with ensuring that they comply with all the required mining regulations to avoid heavy penalties associated with the mining and extractive industry of Zimbabwe. Throughout the world, extractive industries do not have standards guiding the implementation of EMA, they follow IFAC and UN guidelines, while other countries (like Japan) have specific EMA policies.

7.3.4. Significant contributions of EMA in Zimbabwe

The significance of EMA in the mining sector is not questionable. The unparalleled contributions of EMA has largely been in its ability to track, trace and appropriately allocate environmental costs to cost centres. This helps in unbundling costs which were included in overheads of an organisation. EMA does not only contribute to environmental performance but also to economic performance; unlocking the potential of harvesting environmental benefits which have been locked in globally competitive green markets. In Zimbabwe EMA has been relegated to promote organisational innovation, and ensuring that companies are proactive to environmental requirements, hence reducing the heavy penalties imposed on them for lack of compliance to environmental regulations. Through EMA the hidden environmental benefits become apparent. EMA opens avenues for other initiatives beyond the breadth of implementing companies. These benefits are unique to organisations in the implementation mode. Zimbabwe is yet to unlock that and realise benefits which can be at its disposal. One of the undisputed benefits of EMA is its contribution towards accountability and transparency in the sector which is on record for being involved in corrupt practices. Environmental disclosures through EIAs are strengthened through EMA initiatives. Social contracts between the mining companies and communities are also fulfilled through EMA. Though EMA does not significantly address environmental externalities, its contribution towards reducing harmful environmental externalities is substantial.

7.3.5. The development and implementation process

The development and implementation process of EMA has no boundaries in which to quantify if EMA is at an entry or late stage of developing or implementation. Since there are no guidelines in the mining industry, it is difficult to measure the stage of EMA development. Based on the knowledge

of EMA in the industry, it can be concluded that the concept of EMA is at its inception and mining companies and all the sectors of the economy need to be educated towards a holistic adoption of EMA in Zimbabwe. This helps organisations to move towards one direction of implementation. Though it has been said that the mining sector is complex and adoption of EMA is difficult in the sector, the development of a sector-specific implementation model helps in standardising EMA systems and comparisons of activities will improve after developing EMA systems. There was no record found for the procedural implementation of EMA following laid down stages by IFAC (2005) from the inception of the idea through introduction, growth and maturity stage. The availability of this in any organisation could have helped in determining the development and implementation stage of EMA. With this, the study concludes that EMA is in its early stages of adoption in Zimbabwe and it is partially being implemented haphazardly with companies being forced by the regulations in the sector to consider environmental issues and also being forced by contemporary cultural norms in the sector to take care of the environment in order to survive in the industry.

7.3.6. Model EMA framework

A model EMA framework proposed for Zimbabwe follows the framework developed by Burritt *et al*., (2002); IFAC (2005) and the United Nations (2001b) EMA procedures and principles. These frameworks are comprehensive in nature though they are generic and not specific to the mining sector. The frameworks identified the mining sector as a gap which requires specific guidelines to be developed due to its complex nature. It is important that observations inform a model framework to follow for this study. It was not possible to conduct observations of the accountings systems of the mining sector to understand the flow of costs that can be used to develop a comprehensive framework that directs the implementation of EMA in the mining sector of Zimbabwe. A comprehensive model framework or an implementation framework would help in standardising EMA in the mining sector and avoids the complex nature of the flow of processes in the extraction and processing of resources. The model framework proposed in this study help in reducing implementation ambiguities which have been noticed in developed countries. The framework is generic in nature to all the mining companies and flexible to allow wide application. It also gives companies a flexibility in adopting a model that is unique to the complexities of different companies in the extractive industries and mining sector. It is not prescriptive in nature but proactive. Since EMA is at inception stage in the mining sector, a generic framework across different mining companies work better. Thereafter, a specific framework can be developed for different categories of mining companies in the extractive industry and mining sector with unique operations. The framework is unique in that it is responding to the observed requirements of the mining industry of Zimbabwe based on data collected and literature.

7.4. Research Contributions

The contributions of this study have been separated into three main areas which are; theoretical contributions, methodological contributions and, lastly, practical contributions**.**

7.4.1. Theoretical Contributions

The major theoretical contribution in this study is the ability to build literature on EMA in Zimbabwe extractive industries and mining sector. To the author's knowledge, there has not been any research carried out in Zimbabwe on Environmental Management Accounting. The development of literature in this research area is a starting point for the EMA initiatives. The study has put forward theoretical arguments why companies in Zimbabwe might be willing to adopt EMA and this was backed up by relevant empirical evidence from the field work through interviews and questionnaires distributed to participants who are engaged with the phenomenon in their day-to-day work. Evidence from this research indicates that embedding environmental accounting into day-to-day business operations and decisions is possible and companies are willing to take on the EMA initiatives because of their envisaged ability to improve environmental benefits through taking care of environmental costs in the form of negative environmental impacts. Theory building helped in collecting relevant data and in understanding EMA systems. The researcher was able to contribute towards addressing the gap in EMA extractive industries research in Zimbabwe. The IFAC has acknowledged the paucity of literature on EMA especially in developing countries and emerging markets. This theoretical contribution is not only for Zimbabwe, but can be applied in the SADC regions, Africa, developing countries and the world at large in an effort to understand EMA. Though there is a risk in generalising the results of this research, its contribution provides a foundation for understanding the complexities of the mining industry in EMA development and implementation.

7.4.2. Methodological Contributions

Zimbabwe suffers from a closed culture towards research and data collection by academics. Some scholars have attributed the behaviour to be the protective measures of the political environment of the country. The method used to collect data has never been precedent in literature. Previous research in EMA has typically started with list of ledger accounts to understand EMA. This study initially employed the same approach and failed to get the list of ledger accounts as it was deemed to be confidential information. The study then used the snowball sampling approach with a qualitative

bearing. Most research which has been conducted in EMA has been based on literature reviews, not the actual engagement with practitioners on the ground. The researcher then collected data from participants and collated it into meaningful interpretations. Thus, methodologically, the contribution is in the approach use to, "get as much relevant data as one can". This was approaching the data collection with an open mind in order to get data in any way possible. The research used secondary data in the form of financial reports and sustainability reports. Data was collected using questionnaires and face-to-face interviews through the use of business networks and friends to help in obtaining data. This was possible because of the research clearance from the industry as well as the University of study. Though the researcher had the clearance required, some mining companies were still reluctant to participate and the study had to rely on interpersonal networks to get information. This was a major innovative approach in the methodology.

7.4.3. Practical contributions

This research introduces Environmental Management Accounting systems to the mining sector and extractive industry of Zimbabwe. The research highlights the need for mining companies to implement EMA to realise its full potential for addressing environmental performance issues. EMA encourages multinational companies and small mining companies to embrace team work in EMA to obtain environmental efficiency and gain the financial advantages which come through EMA initiatives. The practical contributions are in the form of EMA being able to generate benefits beyond traditional markets. The EMA system introduces new organisational innovations and reduces environmental impacts, thus helping companies to be sustainable. The environmental costs incurred have a commensurate environmental benefit.

This study will help the government of Zimbabwe to develop guidelines or EMA implementation policy like some of the developing countries and developed countries. EMA is not only a control mechanism to increase environmental compliance burden; it is also a tool which helps organisations with environmentally related organisational innovations which uncovers environmental costs and benefits at the same time by harvesting environmental benefits through reducing environmental costs.

The existing knowledge deficiency that assumes that EMA initiatives are only expensive have been demystified. This study shows that EMA initiatives are not only expensive, but their benefits outweigh the costs. Green accounting must be embraced by companies in the mining sector for them to remain competitive. The study also revealed that EMA is not only an area that is seeking relevance in accounting and environmental issues, but it is also an area that helps organisations to embrace their benefits and at the same time, increasing their environmental performance and organisational attractiveness to potential investors in different markets. EMA initiatives improves the image of

companies, and corporate social responsibility is also strengthened. Other practical contributions of this research include increased accountability and transparency.

The study explicitly gives the dynamics of EMA in Zimbabwe, that is, how it is perceived and applied by different companies. The envisaged benefits of EMA have been brought to the fora with major ones being environmental preservation and protection. The mining sector and extractive industry of Zimbabwe reveal that profit making is not the only reason why EMA should be developed further but that sustainability is the major relevance of the need to implement EMA. This study has, therefore, strengthened the issue of implementing EMA for sustainability purposes in the sector.

7.4.3.1. Management implication

The area of study has management implications on decision making. EMA can be taken as an environmental performance management tool kit which help in refining environmental decisions. The system can be used by both financial managers and environmental managers as it has both the physical aspects and monetary aspects. EMA help in bringing different management experts together in solving the environmental issues at organisational level, thereby keeping eyes open for both opportunities and threats to business operations. Management is obliged to keep searching for better ways of improving accounting systems which offer a win-win solution to all the company stakeholders.

7.4.3.2. Policy implication

The EMA framework has potential to change the ‘business as usual’ approach by many corporation and embrace sustainability in the extractive industry and mining sector. The starting point for implementing EMA has been pointed out, and the ministry has to make a decision as to whether they incorporate the recommendations of this study. The researcher is obliged to share the finding of this study with the Ministry of Mines and Mining Development of Zimbabwe as part of the agreement to carry out the research in the extractive industry and mining sector. The study intends to push the Ministry towards the process of implementing EMA in Zimbabwe. The study recommends the use of incentives in the implementation of EMA to increase its adoption in Zimbabwe. This ensures that the environmental benefits which come with implementation may be harvested in time. The government is in the processes of changing the regulations governing the mining sector and this study positions EMA for adoption and inclusion in the new mining regulation. The study encourages organisations to look out for externalities, which end up as government burden. Through this study the government may pursue alternative ways of ensuring that externalities are reduces to a minimum level.

7.5. Weaknesses of the Research Approach: Research Design

There are a number of challenges inherent in qualitative research design some of which were experienced in this study. Over reliance on one research approach is seen as a weakness in research design. The approach used in this study is aligned to the qualitative research design limited with quantitative research design. Qualitative research solely depends on good interpretation of data which can be subjective. The researcher could not find data sets to conduct the quantitative research design. This unavailability of already existing data on EMA could be viewed as a challenge; however, the researcher made effort to triangulate the data by using more than one data collection method to ensure consistency in data and not to wonder too far from reality.

The lack of a national database on the population of the companies in the mining sector compelled the study to rely on the USGSS data for the population. The researcher could not rely on sampling of the whole population because some of the mining companies which are on the USGSS database are not operational and some of them were not willing to cooperate in the initial contact. Hence the researcher made use of snowball sampling which could have bias in the information collected. The research approached informants who referred other participants in the industry until saturation of the required information was reached. This could pose a challenge in getting companies which were related in activities and could pose a threat of not looking at other companies which specialised in different mining categories distinguished by the minerals they mine and the type of mining they conduct. By type of mining, the research is referring to either open cast mining or underground mining, which all have different environmental impacts. However, the researcher was not concerned with the type of mining, but the overall environmental impact the mining sector has in the mining sector and Zimbabwe at large.

Another weakness observed in this study is that, the mining sector was used as the case study and the mining houses or companies as unit of analysis for both the survey data and secondary data. The researcher experienced political constraints to do a detailed study of the multiple cases in the mining sector. This could have provided more detailed information on how EMA is being implemented in the mining sector and extractive industries of Zimbabwe. The data for the survey and case study was all collected from the mining companies, making comparative analysis easy. A sample of 34 companies was obtained through the snowball method from a total population of over 89 registered mining companies in the sector. Although the research did not dwell on representativeness of the sample due to the research approach adopted, the data was statistically significant considering the total population in the sector according to USGSS data.

The other challenge relates to data analysis and interpretation. There were cases where some responses in the questionnaires were contradicting prior answers while some were not making sense.

This information had to be tabulated for follow up through interviews to clarify conflicting information. Some of the conflicting results which were not clarified have been presented so that further research will be conducted to address them. Related to the data analysis challenge is research bias. This was resolved by collecting data directly from participants and collating their views through questionnaires. It was impossible for the researcher not to get involved in understanding EMA in the extractive industry of Zimbabwe. The lived experiences of the professionals in the field were outstandingly descriptive of practice. The research bias was contained or reduced using the qualitative research design with the interpretivist approach through which the researcher described the lived experiences of the participants rather than his views.

7.6. Recommendations

The study put forward recommendations necessary for the development and implementation of Environmental Management Accounting in Zimbabwe's extractive industry and mining sector. The recommendations also helped in reducing the negative unsustainable environmental effects of mining and increasing environmental benefits which accrue due to the implementation of EMA in the industry.

Mining sector companies should understand the material flow cost accounting through use of physical Environmental Management Accounting (PEMA) and monetary Environmental Management Accounting (MEMA).

There is need to priorities the development of the mining sector specific Environmental Management Accounting standards/policies in Zimbabwe. These standards should also be harmonised with already existing accounting standards. The government of Zimbabwe should be in the forefront giving incentives to companies to effect and explore avenues through which the country at large could benefit from the implementation of EMA.

The accounting professionals should embrace the changes which are being brought about by sustainability accounting and ensure that the curriculum appropriately addresses accounting for the environment within the current existing accounting standards. Evidence from the practitioners indicated that most of the professionals in accounting are not adequately skilled to carry out fully-fledged environmental accounting.

The development and implementation of EMA should follow a set of guidelines in order to understand the implementation stages and measure them accurately throughout the sector. This calls for the development of an implementation matrix which act as checks and balances in EMA.

It is recommended that different professionals (accountants, environmentalist and engineers) work together for the full development of EMA in order to harness good results out of EMA initiatives. In addition, the professionals should be educated enough to understand that there is no need for gate keepers in EMA for the greater good of both professionals and to achieve sustainability in the sector. Some professions have been on record for protecting their profession from the other groups to avoid being put out of business and lose relevance to the cause. Collective understanding of the need for EMA is needed to harvest great benefit.

EMA methods should be developed to inform the mining sector executives of the potential benefits which can be unlocked through EMA, which include access to globally competitive green markets for the mining sector products. These awareness initiatives will ensure environmental performance and the overall standardisation of EMA in the sector.

Considering the difficulties faced in data collection in the mining sector of Zimbabwe, it is recommended that the mining fraternity be educated about the need for academics to collect data for the betterment of the sector, not for other unethical reasons. The sector needs to understand the reasons for ethical clearance which protect them in how data collected from them is treated. Academic research is often aimed at overall improvement of the sector. It is also important that the mining companies' executives and juniors be informed about the impact of research on policy changes and overall improvement of the organisations' efficiency for sustainability.

Environmental Management Accounting should not solely focus on punitive action in implementation and ideas which draw away revenue from mining companies but should also find ways of regulating the sector for better environmental performance, and ways which improve or increase organisational profits and improve the image of an organisation. In essence, this means finding ways which will leave an organisation in a better position than before EMA was implemented because one of the challenges EMA is facing is the envisaged expensive nature of adopting EMA initiatives/systems which has resulted in small mining companies not attempting to understand what sustainability accounting is all about.

Mining companies should study examples from other companies in developed countries and emerging markets like Xerox and find out how they were able to make profits out of EMA initiatives. Furthermore, companies who are willing to implement EMA or sustainability accounting should not only focus on profit taking and benefits but also environment sustainability which might be outside profit making or benefit accrual for companies, yet beneficial to the ecosystem including humans and their future generations.

The government of Zimbabwe should put forward incentives which encourage the adoption of EMA. The incentives should not be punitive in nature but encourage companies to make EMA-driven initiatives. The initiatives may include lessening the financial burden in EMA implementation by giving government subsidies or reducing the tax liability of companies which will be implementing EMA following laid down policies and procedures formulated by the government through the environmental ministry.

7.7. Future Research Directions

Environmental Management Accounting has been viewed as an organisational innovation (Ferreira *et al.*, 2010; Schaltegger *et al.*, 2017) scheme through which organisations can learn to think outside their comfort zones or the norm. To this end, further research could be conducted to focus on how organisational innovativeness could be enhanced through Environmental Management Accounting implementation. There is also need to take a look at the role the government can take in improving sustainability in the mining sector through the use of organisational accountability transparency initiatives embodied around sustainability accounting.

This research could not establish the impact of EMA on social issues and how social issues could be recorded by means of EMA initiatives. It will be fitting to carry out research to examine the impact of EMA on social issues and how they can be recorded. The study has also sought to understand how the government currently regulates the mining sector of Zimbabwe. It will be important to carry out further research which asks questions such as, what is the role of legislation in Environmental Management Accounting? This remains a gap to be addressed since EMA is not regulated by Accounting Standards as in traditional accounting but by guidelines which companies are at will to adopt or not to adopt. The current study had anticipated to develop a model framework for EMA based on observations, but this objective was not addressed due to lack of cooperation from the mining houses which were not willing to allow the researcher to observe the flow of resources and the accounting systems currently being used. In addition to this, the current EMA model based on literature can be piloted and developed further in the Zimbabwean extractive industries and mining sector based on actual observations. The current study has developed an initial foundation for further related research in Zimbabwe in this area. The research could be carried out in those industries with high environmental negative impacts like the waste management industry, city councils, the food and beverage industry among others.

7.8. Summary and Deductions

The chapter gave the overall summary of the whole dissertation from chapter one up to chapter six. This was followed by research findings as given by the discussion in chapter five. The study showed that EMA contributes positively towards sustainability and its impacts are beyond the comprehension of companies not implementing it. The importance of it can never be over emphasised since it is glaringly visible. The chapter presented research conclusions and contributions together with policy recommendations in the mining sector and extractive industry of Zimbabwe which are in line with Environmental Management Accounting. The chapter closed by giving future research direction of EMA.

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Appendices

Appendix A: Questionnaire

AN ASSESSMENT OF THE IMPACT OF ENVIRONMENTAL MANAGEMENT ACCOUNTING IN ZIMBABWE'S EXTRACTIVE INDUSTRIES

Questionnaire

My name is Cuthbert Muza. I am a Doctoral candidate pursuing a PhD in Public and Development Management at Stellenbosch University in South Africa.

I am conducting a research titled "An assessment of the impact of Environmental Management Accounting in Zimbabwe's extractive industries". It is hoped that the results of the research will open avenues for environmental benefits by being able to record environmental impacts in monetary and physical terms, increasing the tracing of environmental related costs and benefits in an effort to make sound environmental decisions which benefit both the mining companies and the country at large.

The objective of this questionnaire is to solicit your views and perceptions on the impact of Environmental Management Accounting in the extractive industries and mining sector of Zimbabwe in enhancing sustainability, and to gather data based on your opinion and insights concerning the Environmental Management Accounting in your organisation. To this end, I am requesting you to partake in this research as one of the respondents and spare approximately 15-20 minutes to complete the questionnaire. Your response is of utmost importance to me, but your participation in this survey is entirely voluntary.

Your name or contact details are not required on this questionnaire and will remain anonymous. All information you give will remain confidential and will be reported in summary format only. Feel free, therefore, to give as much information as possible in order to make this study a success. Your input and insights are gratefully acknowledged in anticipation.

Note:

- **Your responses will be handled with total confidentiality.**
- **Participation in this research is completely voluntary and you can withdraw from the research at any time.**
- **There is no compensation for your participation.**

Thank you so much for your valuable contribution. For more information contact Cuthbert Muza on +263772398517/ 734 864 680/ 712398517/ +27732724141 or email cuthbertmuza@gmail.com./ 19652259@sun.ac.za

Please tick (√) in the appropriate box or write answers in spaces provided where applicable

Section A- Demographics

Please tell me a little about yourself

1. Gender: Female ☐ Male ☐

2. AGE:

Below 20yrs	21-30yrs	31-40yrs	41-50yrs	51-60yrs	above 60yrs
☐	☐	☐	☐	☐	☐

3. Highest academic qualification.

Qualification	Tick(√)
Ordinary Level	
Advanced Level	
Diploma	
Degree	
Master's Degree	
PhD	
Other(s)	

4. Profession

Accountant ☐ Finance Manager ☐

Process Manager ☐ Engineering Manager ☐

Environmental Manager ☐ Accounts Clerk ☐

Other (specify) ……

5. Work experience in mining industry.

Below 5 years ☐ 6-10 years ☐ 11-15 years ☐ 16-20 years ☐ Over 20 years ☐

6. State your department (work station) in the company ……

Section B: Promotion of sustainability through EMA implementation

1. Are you aware of mining sustainability? Yes ☐ No ☐

If yes, what do you think it is?

……

……

……

2. Do you think the implementation of Environmental Management Accounting will improve the running of mining companies on a day-to-day operations?

……

……

……

3. Are these issues addressed in the accounting systems of the company:

   Social issues Yes ☐ No ☐

   Economic issues Yes ☐ No ☐

   Environmental issues Yes ☐ No ☐

   If yes, how are they being addressed? ……

   ……

   ……

   If no, what do you think should be done to address all the issues? ……

   ……

   ……

   ……

4. Do you think the implementation of EMA will reveal the environmental costs and benefits?

   Yes ☐ No ☐

5. List environmental costs/ liabilities your company is exposed to or likely to be exposed to……

   ……

   ……

   ……

6. List environmental benefits/revenue/income your company is gaining through being environmental conscious.

   ……

   ……

   ……

   ……

7. What are the environmental impacts of your operations?

   ……

   ……

   ……

   ……

8. In your own view, is social and environmental accounting very important? Yes ☐ No ☐

Explain……

……

9. How would you rate the improvements brought by being environmentally conscious and accounting for the impacts in monetary terms?

Very Good ☐ Good ☐ Average ☐ Bad ☐ Very bad ☐

Section C: Perceptions on the significance of EMA

1. Have you ever heard of Environmental Management Accounting (EMA)? Yes ☐ No ☐

If yes, what do you think it is?

……

……

……

……

If no, what do you think it might be?……

……

……

2. What term do you use to refer to the accounting for environmental issues in monetary and physical terms at your company?

……

……

3. Does the company implement EMA? Yes ☐ No ☐ Not sure ☐

Do you have any individual opinion on the importance of EMA to benefit your company?

Yes ☐ No ☐ Not sure ☐

Explain……

……

……

4. What do you think are the financial implications to your company, of damaging the environment?

……

……

……

5. What do you think are the financial implications, to your company, for not using EMA systems?

……

……

……

6. In your own opinion do you think mining companies need a new accounting system which caters for environmental related activities which is completely divorced from traditional accounting systems? Yes ☐ No ☐

Explain……

……

……..

Section D: EMA implementation to benefit Zimbabwe

1. Do you think Zimbabwe can benefit when mining companies implement EMA? Yes ☐ No ☐

If yes, why?

……

……

If no, why not?

……

……

2. What benefits to the Zimbabwean economy can be brought about by implementation of EMA by mining companies ?

……

……

……..

3. Do you think the use of EMA can affect the company's performance?
   Yes ☐ Maybe ☐ No ☐

   Give reasons for your answer:

   ……
   ……
   ……

4. What are the regulations put in place by the government of Zimbabwe to manage the mining companies in general?

   ……
   ……
   ……
   ……
   ……

5. What are the accounting regulations which regulate the accounting of environmental impacts in Zimbabwe's mining sector?

   ……
   ……
   ……
   ……
   ……

6. Do you think these regulations are effective?

……
……
……
……
……

7. Are the regulations compulsory ☐ r optional ☐
   Explain if the adoption of the regulations by mining companies is based on any criteria……
   ……
   ……
   ……
   ……
   ……
8. What do you think is the motivation behind implementing the government regulations given above?
   ……
   ……
   ……
   ……
   ……
   ……
9. Are you aware of any international regulations affecting the implementation of EMA?
   If yes, list the regulations
   ……
   ……
   ……
   ……
   ……
10. Does the government offer any incentives to the company as a way of reducing environment damage? Yes ☐o No☐ure ☐
    If yes, what are these incentives?

    ……

    ……

    ……

    ……

    If no, what do you think are the impacts of not having such incentives?

    ……

    ……

    ……

    ……

    ……

11. Does the company suffer any penalties from the government due to non-compliance to the environmental accounting regulations? Yes No☐ ☐
    If yes, what are some of these penalties?

……
……
……
……

Section E: Challenges to implementing EMA

1. What do you think are the current challenges or hindrances to implementing EMA in your organisation? Tick(√) the challenge/s applicable to your company

Hindrance/ Challenge	Tick (√)
Complex operations which look similar	
Lack of understanding between financial staff and environmentalists	
Lack of commitment to transparency	
Resistance to change	
Lack of funds	
Need for stakeholder and management buy-in	

Other (specify below)

……

……

……

……

……

……

2. Do you think EMA implementation can negatively affect the company's performance?

Yes ☐ Not sure ☐ No ☐

Explain……

……

……

……

……

3. Do you think using EMA, would lead to increased financial performance and environmental performance in your company?

Explain……

……

……

……

……

Section F: Role of Accountants in EMA implementation

1. Do you think accountants are aware of environmental related issues which should be traced, tracked and reported?

   ……

   ……

   ……

   ……

2. Is there a need for environmental managers to work with accountants in the effective implementation of Environmental Management Accounting?

   ……

   ……

   ……

   ……

   ……

3. Should accountants be custodians of environmental related reporting and accounting?

   Yes ☐ No ☐

   If, no which profession in your company should be responsible for this task (environmental accounting)?……

   ……

   ……

   ……

4. Do you think EMA applications are expensive and complex to implement in the mining sector?

   Yes ☐ No ☐

   If, yes, based on your knowledge of the mining sector how much can it cost to implement EMA in your company?……..

5. Do you think the benefits of implementing Environmental Management Accounting can outweigh the lack thereof?

   ……

   ……

   ……

   ……

   ……

6. Which department should be responsible for spearheading the implementation of EMA?

   Accounting and Finance ☐ Production ☐

   Environment Department ☐ Engineering ☐

Any other (specify) ☐……

7. Is there a need for a coordinated effort in reducing environmental impacts and maximise environmental benefits? Yes ☐ No ☐

8. What is the best possible way of implementing EMA in the extractive industries and mining sector? Tick(√) your best possible way.

Through use of existing accounting systems	
Through use of new accounting systems which cater for environmental aspects	
Through environmental managers	
Through engineers	
Through management	
Any other (specify)	

Thank you very much for your cooperation and time

Appendix B: Interview guide

AN ASSESSMENT OF THE IMPACT OF ENVIRONMENTAL MANAGEMENT ACCOUNTING IN ZIMBABWE'S EXTRACTIVE INDUSTRIES

Interview Schedule

My name is Cuthbert Muza. I am a Doctoral candidate pursuing a PhD in Public and Development Management at Stellenbosch University in South Africa.

I am conducting a research titled "An assessment of the impact of Environmental Management Accounting in Zimbabwe's extractive industries". It is hoped that the results of the research will open avenues for environmental benefits by being able to record environmental impacts in monetary and physical terms, increasing the tracing of environmental related costs and benefits in an effort to make sound environmental decision which benefit both the mining companies and the country at large.

The objective of this questionnaire is to solicit your views and perceptions on the impact of Environmental Management Accounting in the extractive industries and mining sector of Zimbabwe in enhancing sustainability, to gather data based on your opinions and insights concerning the Environmental Management Accounting in your organisation To this end, I am generously requesting you to partake in this research as one of the respondents and spare approximately 30 minutes to answer my questions. Although your response is of utmost importance to me your participation in this survey is entirely voluntary.

All information you give shall remain confidential and will be reported in summary format only.

Your input and insights are gratefully acknowledged.

Section A- Sustainability and Environmental Management Accounting

1. What do you understand by Environmental Management Accounting?
2. Is your company involved in the development and implementation of EMA?
3. Does EMA, in your own opinion, promote sustainability in the sector and how?
4. Do you think EMA will record environmental costs better than traditional accounting systems?
    - Which traditional accounting systems do you have?
    - Is there a need for having two separate accounting systems, one which caters for environmental related costs/benefits and the general one which caters for the broad aspects of accounting?
5. What are the government regulatory requirements of the mining sector mostly related to the environment?
    - Is it mandatory or compulsory to comply with environmental accounting requirements?

- Are there any incentives for the adoption of the regulation or punitive measures being implemented by the government for not complying with the regulations?

6. How important is it to track, trace and record environmental costs in the mining sector?
    - Will the lack of EMA affect the smooth running of business on a day to day basis?
7. What do you think are the modalities companies should take in implementing Environmental Management Accounting in the mining sector?
    - What are the aspects to consider?
    - Are there any costs to avoid and benefits to aim for in the implementation process?
    - Is there a department or individuals trusted with the implementation of EMA at your company?
    - How difficult and complex is it to implement EMA?
8. What are the costs for implementing EMA to the companies?
    - Do you think these costs can outweigh the benefits in the long term?
    - Do you think accountants play a role in the implementation of EMA?
    -

Thank you very much for your cooperation and time

APPENDIX C: Consent to participate in research

STELLENBOSCH UNIVERSITY
CONSENT TO PARTICIPATE IN RESEARCH

An assessment of the impact of Environmental Management Accounting in Zimbabwe's extractive industries

You are asked to participate in a research study conducted by Cuthbert Muza , from the School of Public Leadership at Stellenbosch University. The results of this study will be contributed to my research paper and dissertation. You were selected as a possible participant in this study because we believe you have knowledge and capacity to contribute to this research and the subject under study since you are involved in the activities of the mining sector of Zimbabwe.

1. PURPOSE OF THE STUDY

The research aims to understand how the government of Zimbabwe currently regulates the extractive industry and mining sector. The research will look at established regulations, that is, environmental reporting regulations and standards which are being used and critically look at a few case studies to establish how the extractive industry and mining sector are regulated in Zimbabwe. The research will then discuss what Environmental Management Accounting is, in relation to this research. The research will establish the appropriate definition and demarcation of the study based on evidence from the literature. The definition for EMA differs from organisation to organisation depending on the need for EMA (Schaltegger & Zvezdov, 2015). This research will establish the meaning of EMA and its components in the mining sector and extractive industries. The study will further explore how EMA potentially promotes sustainable industry and mining development. There is a need to look at what sustainable development and unsustainable development are in the current mining regulation. The study will explore the impact in the absence of EMA at this stage (benefits and negative effects caused by the lack of EMA systems). Finally, the research will develop a suitable framework for the implementation of EMA which is appropriate to Zimbabwe and other developing countries with active mining and extraction industries. The framework will be based on best practices which shall be adopted from empirical evidence that will be gathered from developed countries currently implementing EMA in their mining sectors.

2. PROCEDURES

If you volunteer to participate in this study, we would ask you to do the following things:

- Help with answering the questionnaire provided
- Attend my interviews and answer the questions.
- Provide financial reports, sustainability reports and ledger account listings where possible of the company you are representing.

I request to take about 15-20mins of your time in answering the questionnaire provided, about 30mins of your time in responding to the list if interview questions to be given to your prior to the interview. These procedures will be done once and if there is need for clarity I might contact you and schedule another meeting date. The location of the procedures will be at the place agreed between the interviewer and the interviewee.

3. POTENTIAL RISKS AND DISCOMFORTS

There are no foreseeable potential risk and discomfort to be caused by this research. The length of time to be spent is based on estimates. The research will be conducted at the convenience of the participant if the participant cannot fit in the schedule of the researcher.

4. POTENTIAL BENEFITS TO SUBJECTS AND/OR TO SOCIETY

The subject might benefit his/her knowledge base by delving into aspects of Environmental Management Accounting. Other than that the overall benefits are to building an environmentally friendly extractive industries and mining sector, opening avenues of environmental savings and benefits.

The research is envisaged to improve environmental accountability thereby increased or opening avenues of environmental benefits.

5. PAYMENT FOR PARTICIPATION

The participation is completely on voluntary basis and no payment will be given to the participants.

6. CONFIDENTIALITY

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. Confidentiality will be maintained by means of ensuring that the identity of the participant remain anonymous and will not be shared with anyone. The information I collect will be kept confidential The information about the participant will not be identified by your name but by a number or code.

If information will be released to any other party if so required by courts of law for legal proceedings or if the information is believed to be of paramount importance to the Government of Zimbabwe. The request for information should be endorsed by the official courts of law of Zimbabwe

The participant has a right to review/ edit any recorded information, audio or videotaped. The information might be released for scholarly or educational purposes with the participant's consent

Confidentiality will be maintained in publishing the articles by not indicating the names of the participant and sharing the manuscripts with participants before publication.

7. PARTICIPATION AND WITHDRAWAL

You can choose whether to be in this study or not. If you volunteer to be in this study, you may withdraw at any time without consequences of any kind. You may also refuse to answer any questions you don't want to answer and still remain in the study. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

8. IDENTIFICATION OF INVESTIGATORS

If you have any questions or concerns about the research, please feel free to contact:

Principal Investigator

Cuthbert Muza

Copyright [redacted]

Copyright [redacted]

Supervisor

Professor Johan Burger

Copyright [redacted]

Copyright [redacted]

GEM Manager

Copyright [redacted]

Copyright [redacted]

Copyright [redacted]

Copyright [redacted] Copyright [redacted]

Copyright [redacted]

9. RIGHTS OF RESEARCH SUBJECTS

You may withdraw your consent at any time and discontinue participation without penalty. You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you have questions regarding your rights as a research subject, contact Copyright [redacted] at the Division for Research Development.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

The information above was described to the participant by Cuthbert Muza in English and the participant is in command of this language or it was satisfactorily translated to him/her. The participant was given the opportunity to ask questions and these questions were answered to his/her satisfaction.

I hereby consent voluntarily to participate in this study. I have been given a copy of this form.

_____

Name of Subject/Participant

_____

Name of Legal Representative (if applicable)

_____ _____

Signature of Subject/Participant or Legal Representative Date

SIGNATURE OF INVESTIGATOR

I declare that I explained the information given in this document to _____ [*name of the participant]* and/or [his/her] representative _____ [*name of the representative]. [H*e/she] was encouraged and given ample time to ask me any questions. This conversation was conducted in *English* and *no translator was used.*

_____ _____

Signature of Investigator Dat

APPENDIX D1: University ethical clearance letter

UNIVERSITEIT·STELLENBOSCH·UNIVERSITY
jou kennisvennoot · your knowledge partner

Approval Notice
New Application

23-Sep-2016
Muza, Cuthbert C

Proposal #: SU-HSD-002424
Title: An assessment of the impact of environmental management accounting in Zimbabwe's extractive industries

Dear Mr Cuthbert Muza,

Your **New Application** received on **10-Aug-2016**, was reviewed
Please note the following information about your approved research proposal:

Proposal Approval Period: **13-Sep-2016 -12-Sep-2019**

Please take note of the general Investigator Responsibilities attached to this letter. You may commence with your research after complying fully with these guidelines.

Please remember to use your **proposal number** (**SU-HSD-002424**) on any documents or correspondence with the REC concerning your research proposal.

Please note that the REC has the prerogative and authority to ask further questions, seek additional information, require further modifications, or monitor the conduct of your research and the consent process.

Also note that a progress report should be submitted to the Committee before the approval period has expired if a continuation is required. The Committee will then consider the continuation of the project for a further year (if necessary).

This committee abides by the ethical norms and principles for research, established by the Declaration of Helsinki and the Guidelines for Ethical Research: Principles Structures and Processes 2004 (Department of Health). Annually a number of projects may be selected randomly for an external audit.

National Health Research Ethics Committee (NHREC) registration number REC-050411-032.

We wish you the best as you conduct your research.

If you have any questions or need further help, please contact the REC office at .

Included Documents:

DESC Report
REC: Humanities New Application

Sincerely,

REC Coordinator
Research Ethics Committee: Human Research (Humanities)

APPENDIX D2: School of Public Leadership clearance letter

Bellville Park Campus / Bellville Park Kampus:
Carl Cronje Drive / Rylaan, Bellville, 7530, RSA
PO Box / Posbus 610, Bellville, 7535, RSA
Tel: +27 (0)21 918 4132, Fax: +27 (0)21 918 4123,
www.spl.sun.ac.za

10/08/2016

To Whom It May Concern

SCHOOL OF PUBLIC LEADERSHIP (SPL)

*This letter is to certify that **Mr Cuthbert Muza** Copyright research has been approved internally by the School of Public Leadership Ethics Committee and that he is now awaiting the official letter from the Research Ethics Committee (REC). The SPL therefore confirm that Mr Cuthbert Muza can continue with his data gathering and findings.*

[Stellenbosch University, School of Public Leadership]

Copyright

Copyright

Date: 10/08/2016

APPENDIX E: Ministry of Mines and Mining Development clearance letter

All correspondence should be addressed to "THE SECRETARY"

Copyright

ZIMBABWE

Office of the Permanent Secretary
of Mines and Mining Development
Prof. F.P Gudyanga
ZIMRE CENTRE
Cnr. Nkwame Nkurumah and L. Takawira
Harare

Ref: A / 3 / 36

07 June 2016

Mr Muza Cuthbert

Copyright

REQUEST FOR AUTHORITY TO CARRY OUT A RESEARCH ENTITLED "AN ASSESSMENT OF THE IMPACT OF ENVIRONMENTAL MANAGEMENT ACCOUNTING IN ZIMBABWE'S EXTRACTIVE INDUSTRIES". MR MUZA CUTHBERT: A PHD CANDIDATE IN PUBLIC AND DEVELOPMENT MANAGEMENT: STELLENBOSCH UNIVERSITY

The above subject refers.

Please be advised that, the Permanent Secretary for Mines and Mining Development has approved your request to conduct a research entitled "An assessment of the Impact of Environmental Management Accounting in Zimbabwe's Extractive Industries".

Please be advised that the information gathered in the research shall be used for academic purposes only and you are required to submit a copy of the project report to the Ministry upon completion of the research.

The Ministry wishes you the best in your research.

Copyright

Director Human Resources
For: PERMANENT SECRETARY FOR MINES AND MINING DEVELOPMENT

cc: Permanent Secretary for Mines and Mining Development

The Principal Director Technical Services

The Principal Director Mining Promotion, Value Addition, Beneficiation and Development